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# PHYCOLOGIA BRITANNICA:

OR

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,  
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

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BY

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IN FOUR VOLUMES.

VOL. I.

MELANOSPERMEÆ, OR OLIVE SEA-WEEDS.

SYNOPSIS, No. 1 to 97.

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LONDON :

REEVE AND BENHAM,  
HENRIETTA STREET, COVENT GARDEN.

1846-51.







TO

SIR WILLIAM JACKSON HOOKER,

K.H., D.C.L., F.R.S., V.P.L.S., ETC., ETC.,

*Director of the Royal Gardens of Kew,*

THIS WORK IS INSCRIBED

AS A SMALL TRIBUTE OF THE WARM AFFECTION, ADMIRATION, AND GRATITUDE

OF HIS ATTACHED FRIEND,

THE AUTHOR.







## ADVERTISEMENT.

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IN the Introduction to my “Manual of the British Algæ,” published on the eve of my last voyage to the Cape of Good Hope, I stated the strong wish that I felt of accompanying the descriptions in that little work by plates, illustrative at least of the genera, and apologised for their omission by the briefness of my stay in Europe. Since my final return home I have been frequently applied to, by persons interested in marine botany, to fulfil in some way the promise then partly held out, either by publishing a new, enlarged, and illustrated edition of the “Manual,” or a new work on the same subject, and on an extended plan. After some consideration I have preferred the latter course, and undertaken the present Work, in which it is intended first to give coloured figures, accompanied by detailed descriptions, of every British species of Marine Algæ or Sea-weed; and, on the completion of this portion of the work, to add to the last volume a general Introduction to Marine Botany, and a systematic synopsis of the British Marine Flora.

The recent publication of Mr. Hassall’s ‘History of the British Freshwater Algæ,’ in which he has given figures of all the species known to him, affords me an opportunity of limiting my attention to the *marine* algæ, which are so much more attractive to the generality of students and collectors, and thus enables me to reduce the number of plates and the consequent expense of the work very considerably.—I also propose to omit the *DESMIDIEÆ*



and DIATOMACEÆ, tribes of organised beings which can hardly be regarded as *genuine* Algæ, but rather as forming a Class so nearly balanced between the animal and vegetable kingdoms, that those who have most attentively studied them are divided in sentiment respecting the kingdom to which they belong. I the more readily omit them because Mr. RALFS—the LYONNET of this department of Natural History—is preparing a separate work, to be accompanied by coloured plates, on these Families. Every admirer of patient industry, acute observation, and extensive research into these hidden things of nature,—one of her worlds of whose existence, though distributed in all waters and all lands, we are unconscious till the microscope reveals them to us,—must rejoice that a work requiring so much acumen and patience has fallen into such able hands.

As some set-off against the above omissions, the present work will include the British species of *Corallina*, *Halimeda* and *Nullipora*, which recent discoveries and observations have fairly proved to belong not merely to the vegetable kingdom, but to be closely connected by affinity with many of the Algæ; in short, to be Algæ in disguise, some of them related by their fructification to *Rhodomeleæ*, others to *Batrachospermum*, and others again to *Codium* and *Bryopsis*.

With regard to the method of publication, two plans suggest themselves, each of which has its advantages. The first is, having taken a view of the whole subject, to adopt a *Systematic Order*; to commence with the first genus of the arrangement, to go regularly through the species, then those of the next and following genera, and so on to the conclusion of the work. Thus the several tribes would follow in correct order; the first plates would represent the highest or the lowest type of organization, as either was selected as a starting point, and those that followed would exhibit a regular gradation of affinity to the opposite end of the series. This is the course which, were the work to issue as a whole from the press, one would naturally follow; but in an extensive periodical work which it will take five years to complete,



on a tribe of plants among which new species are constantly being discovered or added to the Flora, this plan is open, among others, to the grave objection that it forbids the introduction or early publication of *new* species, probably of much greater interest than those which it first illustrates.

The second plan, and which, for many reasons I have adopted, is to select the species illustrated in each number from several different genera taken from as many families, so that there shall always be a variety of subjects in the monthly number; and, as early in the work as possible, *to figure one species at least of every genus*, so that by the end of the twentieth number, which will complete the first volume, illustrations of all the genera may be placed before the student. This, with the aid of the descriptions of species and sketch of a general arrangement afforded by the “*Manual*” (which may serve as a Synopsis of the principal contents of the ‘Phycologia’), will afford him very great facilities for determining his plants during the progress of this work, even though the particular species which he has under examination may not be among those then figured in it. Were the plates to be published systematically, according to the first-mentioned plan, it is obvious that not till the completion of the entire work would the student have as much assistance toward understanding the genera as he will now have at the end of the first volume. This arrangement is therefore decidedly the best for those who have purchased the “*Manual*,” and as it appears to me, for those also who, now commencing the study of *Algology*, wish to obtain speedily a general view of the principal varieties of marine plants. The main objection to this mode of publication is, that purchasers who wish to have their copies bound up in systematic order, must defer the binding till the whole is published. This is an inconvenience common to other similar works, to Smith and Sowerby’s ‘*English Botany*,’ Greville’s ‘*Scottish Cryptogamic Flora*,’ &c.; but it is one which, in my judgment, is outweighed by other manifest conveniences.

In concluding this Advertisement I take the liberty of soliciting



from all who feel an interest in the subject, such specimens of the rarer British Algæ from all parts of the coast, as may serve to illustrate either some peculiarity of growth, or throw light on distribution, or otherwise complete the history of the species. And I beg to assure such contributors, that it will always afford me pleasure to acknowledge their assistance, answer their queries, and communicate, in return, specimens which may be among their desiderata.

W. H. H.

Trinity College, Dublin,  
Dec. 3rd, 1845.

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## PREFACE.

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IN issuing the first part of this work, on the 1st of January, 1846, it was proposed that it should comprise figures and descriptions of all known British Marine Algæ. The number of species enumerated in the Synopsis is 388, of which 378 are figured on the 360 plates contained in these volumes. The remaining ten unfigured species are either altogether obscure and uncertain, or else are of such rarity, that I have been unable to obtain specimens of them. Of the genera *Ectocarpus*, *Polysiphonia*, *Ceramium*, *Callithamnion*, *Cladophora*, and *Enteromorpha*, of which several are now introduced for the first time to the British list, some few distinct-looking forms, preserved in my own and other herbaria, remain unfigured for further examination, and possibly some that may eventually rank as species. I am aware that already several of them have received names in the 'Species Algarum' of Kützinger, but I have hesitated adopting them, from a well-grounded fear, that in doing so without a very careful examination of specimens of all ages, I should only open the door to a flood of spurious species, and convert the study of these plants into a mere effort to arrange and describe solitary or deformed specimens. Every student of marine botany must know that the Algæ, more than most other plants, *sport* (as the gardeners phrase it) into endless varieties, sometimes on account of circumstances in their habitat, and sometimes from reasons unknown to us. *Halymenia ligulata*, *Gelidium corneum*, and many others which might be named, put on so many forms, that a botanist, unfamiliar with them or judging merely from dried specimens, could scarcely avoid making every form a distinct species. And why should we deny an equal latitude to our old friend *Ceramium rubrum*, which some modern botanists would divide into almost as many species as there are individuals? I have never been quite satisfied of the propriety of separating *C. botryocarpum*, the only new species of this group on which I have ventured; but had I followed the wishes of some of my correspondents, I should have split *C. rubrum* into at least a dozen. I felt, however, that in doing so, I should be preparing so many puzzles for those that may come after me, and that instead of the author of a future Phycologia having to tell that his predecessor had left him but ten species which he had been unable to ascertain, my successor would have at least a hundred to lay at my door. To avoid such a consummation, I have abstained from much species-splitting which has been suggested to me, and perhaps have sometimes erred, but, as I think, on the safer side, by over-caution. In a few cases, in the genera *Ectocarpus*, *Cladophora*, and *Enteromorpha*, where I have used some latitude, I have possibly gone in some cases too far. For these sins I entreat a charitable criticism on the same grounds of excuse offered by a



lively Quaker when reproved, by a graver brother, for his witticisms: "Friend, if thou knew how much I keep in, thou wouldst not find fault with what I let out." And if you, dear Critic, could know the number of puzzling forms of Algæ which in the course of the last five years have passed through my hands, and which I have had to reduce to their specific types, you would judge leniently of my mistakes, where I may have been deceived by such forms, and wrongly proposed them as new species.

Whatever may be my errors in this respect, I have the satisfaction to know that the study of British Marine Botany has been fostered and extended by this work; and this, to an author who feels a personal interest in his subject, is the best reward for his labours. A progressive taste has shown itself for these plants, in the large increase of collectors within the past five years, and in the number of my correspondents since the monthly issue commenced. Many new species have been discovered, and several others added to the British list; and several, which had not been gathered for many years previously, have been rediscovered, some in new habitats, and some in their old, but lost, stations. Very few of these discoveries or additions have been made by myself, but are due to the zeal of my correspondents, a majority of whom, familiar as I am with their handwriting and friendly feeling, are personally unknown to me.

To those kind correspondents I would now return my most grateful thanks. Their number is too great to particularize every name, and I dare not trust myself with naming many, lest I might accidentally omit some valued friend;—but there are a few to whom I cannot omit a further expression of gratitude for their unwearied assistance, and the essential service they have rendered to me. And first I would express my deep obligation to my invaluable friend Mrs. Griffiths, to whose contributions almost every page of these volumes bears witness, and without whose assistance many rare species could not have been properly illustrated. To my kind Plymouth friends, the Rev. Mr. Hore, Dr. Cocks, Mr. Rohloff, and Mr. Boswarva, I am indebted for many hundreds of beautifully preserved specimens. To Miss White and Miss Turner I owe almost all my acquaintance with the Algæ of the Channel Islands, and the latter lady has added more than one new species to our list. To Rev. Mr. Pollexfen and Dr. M'Bain I am indebted for Orkney Algæ; and to Miss Warren, Miss Ball, Miss Gifford, Miss Cutler, Mrs. Gatty, Mrs. Gulson, Mrs. Hayden, Rev. Dr. Landsborough, Dr. Dickie, Mr. Ralfs, Rev. Mr. Cresswell, &c., for specimens of the rarer Algæ of their respective neighbourhoods; and to these, and all other kind friends, whether enumerated in this place or in the body of the work, I would now record my obligations of gratitude for their liberal communications and sympathy.

W. H. H.

Trinity College, Dublin.

July 30, 1851.

# SYNOPSIS

## OF THE

### ORDERS AND GENERA.

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#### SUB-CLASS I. MELANOSPERMEÆ OR FUCALES.

(Olive Seaweeds.)

Order 1. FUCACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are contained in spherical cavities of the frond.*

\* *Air-vessels stalked.*

I. SARGASSUM. *Branches bearing ribbed leaves. Air-vessels simple.*

II. HALIDRYS. *Frond linear, pinnate, leafless. Air-vessels plurilocular.*

\* \* *Air-vessels immersed in the frond, or none.*

III. CYTOSSEIRA. *Root scutate. Frond much branched, bushy. Receptacles cellular.*

IV. PYCNOPHYCUS. *Root branching. Frond cylindrical. Receptacles cellular.*

V. FUCUS. *Root scutate. Frond dichotomous. Receptacles small, filled with mucus, traversed by a net-work of jointed threads.*

VI. HIMANTHALIA. *Root scutate. Frond cup-shaped. Receptacles very long, strap-shaped, dichotomously branched.*

Order 2. SPOROCHNACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are attached to external, jointed filaments, which are either free, or compacted together into knob-like masses.*

\* *Spores attached to pencilled filaments.*

VII. DESMARESTIA. *Frond solid, distichous, filiform, or flat.*

VIII. ARTHROCLADIA. *Frond filiform, nodose, traversed by a jointed tube.*

\* \* *Spores in knob-like receptacles.*

IX. SPOROCHNUS. *Receptacles lateral, stalked.*

X. CARPOMITRA. *Receptacles terminal.*

Order 3. LAMINARIACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are superficial, either forming cloud-like patches, or covering the whole surface of the frond.*

XI. ALARIA. *Stipitate. Stipes ending in a midribbed leaf.*

XII. LAMINARIA. *Stipitate. Stipes ending in a ribless leaf.*

XIII. CHORDA. *Frond leafless, cylindrical, hollow; the cavity interrupted by transverse partitions.*



Order 4. DICTYOTACEÆ. *Olive-coloured, inarticulate seaweeds, whose spores are superficial, disposed in definite spots or lines (sori).*

\* *Root coated with woolly fibres, frond flat.*

XIV. CUTLERIA. *Frond* ribless, irregularly cleft. *Sori* dot-like, scattered. *Spores* pedicellate, containing numerous sporules.

XV. HALISERIS. *Frond* midribbed.

XVI. PADINA. *Frond* ribless, fan-shaped, concentrically striate. *Sori* linear, concentric, bursting through the epidermis.

XVII. ZONARIA. *Frond* ribless, lobed, concentrically striate. *Sori* roundish, containing spores and jointed threads.

XVIII. TAONIA. *Frond* ribless, irregularly cleft, somewhat fan-shaped. *Sori* linear, concentric, superficial, alternating with scattered spores.

XIX. DICTYOTA. *Frond* ribless, linear, dichotomous. *Sori* roundish, scattered, bursting through the epidermis: or, (on distinct plants) scattered spores.

\* \* *Root a minute naked disc. Frond cylindrical, branched.*

XX. STILOPHORA. *Spores* concealed among moniliform threads, which are collected into convex, wart-like *sori*.

XXI. DICTYOSIPHON. *Spores* irregularly scattered, solitary, or in dot-like *sori*, not accompanied by moniliform threads.

XXII. STRIARIA. *Spores* in dot-like *sori*, ranged in transverse lines.

\* \* \* *Root naked. Frond unbranched, cylindrical, or flat.*

XXIII. PUNCTARIA. *Frond* flat, leaf-like.

XXIV. ASPEROCOCCUS. *Frond* membranaceous, tubular, either cylindrical or compressed. *Spores* in dot-like *sori*, mixed with a few jointed threads.

XXV. LITOSIPHON. *Frond* cartilaginous, filiform, sub-solid. *Spores* scattered, sub-solitary.

Order 5. CHORDARIACEÆ. *Olive-coloured seaweeds, with a gelatinous or cartilaginous frond, composed of vertical and horizontal filaments interlaced together.*

\* *Frond cylindrical, branching.*

XXVI. CHORDARIA. *Axis* cartilaginous, dense; filaments of the circumference unbranched.

XXVII. MESOGLOIA. *Axis* gelatinous, loose; filaments of the circumference branching.

\* \* *Frond either tuber-shaped, or crustaceous and spreading.*

XXVIII. LEATHESIA. *Frond* tuber-shaped.

XXIX. RALFSIA. *Frond* crustaceous.

\* \* \* *Parasites, consisting of densely tufted filaments, connected at the base, free above.*

XXX. ELACHISTA. *Filaments* pencilled, rising from a tubercular base, composed of vertical fibres.

XXXI. MYRIONEMA. *Tufts* cushion-like; filaments rising from a flat base, composed of decumbent fibres.

Order 6. ECTOCARPACEÆ. *Olive-coloured, articulated, filiform seaweeds, whose spores are (generally) external, attached to the jointed ramuli.*

\* *Frond rigid; each articulation composed of numerous cells.*

XXXII. CLADOSTEPHUS. *Ramuli* whorled.

XXXIII. SPHACELARIA. *Ramuli* distichous, mostly pinnated.

\* \* *Frond flaccid; each articulation formed of a single cell.*

XXXIV. ECTOCARPUS. *Frond* branching; *ramuli* scattered.

XXXV. MYRIOTRICHIA. *Frond* unbranched; *ramuli* whorled, and tipped with pellucid fibres.

## SUB-CLASS II. RHODOSPERMEÆ OR CERAMIALES.

(Red\* or Brown-red Seaweeds.)

Order 7. RHODOMELACEÆ. *Red or brown-red seaweeds, with a leafy or filiform, areolated or articulated frond, composed of polygonal cells. Fruit double: Conceptacles (ceramidia) external, ovate or urn-shaped, with a terminal pore, and containing a tuft of pear-shaped spores: 2. Tetraspores immersed in distorted ramuli, or contained in proper receptacles (called here stichidia).*

\* *Frond flattened, pinnatifid.*

XXXVI. ODONTHALIA.

\* \* *Frond filiform, wholly inarticulate.*

XXXVII. RHODOMELA. *Branches* coated with minute, irregular cells. *Apices* not involute.

XXXVIII. BOSTRYCHIA. *Branches* dotted; the surface cells quadrate. *Apices* strongly involute.

XXXIX. RYTIPHLÆA. *Branches* transversely striate, at short distances.

\* \* \* *Frond filiform, partially or generally articulate.*

XL. POLYSIPHONIA. *Articulations* of the *ramuli* two- or many-tubed. *Tetraspores* in distorted *ramuli*.

XLI. DASYA. *Articulations* of the *ramuli* single-tubed. *Tetraspores* in lanceolate pod-like receptacles (*Stichidia*).

Order 8. LAURENCIACEÆ. *Rose-red or purple seaweeds, with a cylindrical or compressed, rarely flat, linear, narrow, areolated, inarticulate, or constricted and chambered, branching frond, composed of polygonal cells. Fruit double: 1. Conceptacles (ceramidia) external, ovate, with a terminal pore, and containing a tuft of pear-shaped spores: 2. Tetraspores scattered without order among the surface cells of the branches and ramuli.*

\* *Frond solid.*

XLII. BONNEMAISONIA. *Rose-red, excessively branched, distichous; ramuli* subulate, acute.

XLIII. LAURENCIA. *Purplish, yellowish, or reddish, pinnatifid or pinnate; ramuli* obtuse.

\* \* *Frond (at least the branches) hollow.*

XLIV. CHRYSYMENIA. *Frond* neither constricted nor chambered.

XLV. CHYLOCLADIA. *Frond* (at least the branches) constricted at intervals and chambered.

Order 9. CORALLINACEÆ. *Rigid, articulated, or crustaceous, mostly calcareous seaweeds, purple when recent, fading on exposure to milk-white, composed of cells in which carbonate of lime is deposited in an organized form. Tetraspores tufted, contained in ovate or spherical conceptacles (ceramidia) furnished with a terminal pore.*

\* See also *Ulvaceæ* and *Oscillatoriaceæ* among the Green Algæ.



\* *Frond filiform, articulated.*

XLVI. CORALLINA. *Frond* pinnated. *Ceramidia* terminal, simple.

XLVII. JANIA. *Frond* (in the Brit. species) dichotomous. *Ceramidia* tipped with two horn-like ramuli.

\* \* *Frond crustaceous or foliaceous, not articulated.*

XLVIII. MELOBESIA. Opaque, stony; crustaceous, foliaceous, or shrubby.

XLIX.? HILDENBRANDTIA. Cartilaginous (not stony), incrusting rocks.

L.? HAPALIDIUM (Kütz.). Minute, crustaceo-membranaceous, hyaline, composed of a single stratum of cells radiating from a centre.

Order 10. DELESSERIAEÆ. *Rosy or purple-red or blood-red seaweeds, with a leafy, rarely filiform, areolated, inarticulate frond, composed of polygonal cells. Leaves delicately membranaceous. Fructification double: 1. Conceptacles (coccidia) external or half-immersed, hemispherical, usually imperforate, containing, beneath a membranous pericarp, a tuft of filaments, whose cells are finally changed into spores. 2. Tetraspores in distinctly defined sori, either scattered or confined to proper leaflets (sporophylla).*

LI. DELESSERIA. *Frond* leafy, of definite form, with a percurrent midrib.

LII. NITOPHYLLUM. *Frond* leafy, irregularly lobed, without midrib.

LIII. PLOCAMIUM. *Frond* linear, compressed, distichously much branched; ramuli pectinate, acute.

Order 11. RHODYMENIACEÆ. *Purplish or blood-red seaweeds, with an expanded or filiform, inarticulate frond, composed of polygonal cells; occasionally traversed by a fibroso-cellular axis. Superficial cells minute, irregularly packed, or (rarely) disposed in excentric filaments. Fructification double: 1. Conceptacles (coccidia) external or half-immersed, globose or hemispherical, imperforate, containing, beneath a thick pericarp, a mass of spores, on a central placenta. 2. Tetraspores either dispersed indefinitely, or forming cloud-like patches.*

\* *Frond flat, leaf-like, dichotomous, or palmate.*

LIV.? STENOGRAMME. *Conceptacles* linear, rib-like. (*Sori* definite.)

LV. RHODYMENIA. *Conceptacles* hemispherical, scattered.

\* \* *Frond compressed or terete, shrubby, much branched.*

LVI. SPHÆROCOCCLUS. *Frond* linear, two-edged, distichous, traversed by an obscure midrib.

LVII. GRACILARIA. *Frond* filiform (rarely compressed or flat), irregularly branched; the central cells very large.

LVIII. HYPNEA. *Frond* filiform, irregularly branched, traversed by a fibro-cellular axis.

ORDER 12. CRYPTONEMIACEÆ. *Purplish or rose-red seaweeds, with a filiform or (rarely) expanded, gelatinous or cartilaginous frond, composed, wholly or in part, of cylindrical cells, connected together into threads or filaments. Axis formed of vertical, periphery of horizontally excentric filaments. Fructification double: 1. Conceptacles (favellidia), globose masses of spores immersed in the frond, or in swellings of the branches. 2. Tetraspores variously dispersed.*

Sub-order 1. COCCOCARPEÆ. *Frond* solid, dense, cartilaginous, or horny. Favellidia in semi-external tubercles or swellings of the frond.

LIX. GRATELOUPIA. Pinnated, flat, membranaceo-cartilaginous, of very dense structure. *Favellidia* with a pore. *Tetraspores* scattered.

LX. GELIDIUM. Pinnated, compressed, horny, of very dense structure. *Favellidia* in swollen ramuli, imperforate. *Tetraspores* in sori.

LXI. GIGARTINA. *Fron*d variously branched, cartilaginous; its flesh composed of anastomosing filaments, lying apart in firm gelatine. *Favellidia* in external *tubercles*. *Tetraspores* contained in dense, immersed *sori*.

Sub-order 2. SPONGIOCARPEÆ. *Fron*d *solid, dense, cartilaginous, or horny*. *Favellidia* (*of several*) *imperfectly known*. Wart-like swellings (*or nemahtecia*) *composed of filaments, sometimes changed into tetraspores; sometimes into spores*.

LXII. CHONDRUS. *Fron*d flabelliform, dichotomously cleft, cartilaginous; of very dense structure. *Tetraspores* in definite, immersed *sori*.

LXIII. PHYLLOPHORA. *Fron*d stipitate, rigid-membranaceous, proliferous; of very dense structure. *Tetraspores* in superficial *sori*, or in proper leaflets.

LXIV. PEYSSONELIA. *Fron*d depressed, expanded, rooting by the under surface, concentrically zoned. *Tetraspores* contained in superficial warts.

LXV. GYMNOGONGRUS. *Fron*d filiform, dichotomous, horny, of very dense structure. *Tetraspores* in superficial warts.

LXVI. POLYIDES. *Root* scutate. *Fron*d cylindrical, dichotomous, cartilaginous. *Favellæ* contained in external, spongy warts. *Tetraspores* cruciate, immersed in the branches.

LXVII. FURCELLARIA. *Root* branching. *Fron*d cylindrical, dichotomous, cartilaginous. *Favellæ* immersed in the pod-like swollen extremities of the branches. *Tetraspores* similarly immersed, transversely zoned. (*For correct analysis, see Tab. CCCLVII. A.*)

Sub-order 3. GASTROCARPEÆ. *Fron*d *gelatinoso-membranaceous, or fleshy, hollow, or of lax texture within*. *Favellidia* *immersed in the central substance of the frond, very numerous*.

LXVIII. DUMONTIA. *Fron*d cylindrical, tubular. *Favellidia* immersed in the wall of the frond. *Tetraspores* also immersed, cruciate. (*For corrected analysis, see Tab. CCCLVII. B.*)

LXIX. HALYMENIA. *Fron*d compressed or flat, gelatinoso-membranaceous, the membranous surfaces connected by a few slender, anastomosing filaments. *Favellidia* attached to the inner face of the wall.

LXX. GINANNIA. *Fron*d cylindrical, distended, traversed by a fibrous axis; the walls membranaceous, connected with the axis by horizontal filaments. *Favellidia* attached to the walls.

LXXI. KALLYMENIA. *Fron*d expanded, leaf-like, carnosomembranous, solid, of dense structure. *Favellidia* pimply, half-immersed in the frond, and scattered over its surface.

LXXII. IRIDÆA. *Fron*d expanded, leaf-like, thick, carnosocoriaceous, solid, of dense structure. *Favellidia* wholly immersed.

LXXIII. CATENELLA. *Fron*d tubular, branched, constricted at intervals into oblong pseudo-articulations; the tube traversed by a few filaments.

Sub-order 4. GLOIOCLADIÆ. *Fron*d *loosely gelatinous; the filaments of which it is composed lying apart from one another, surrounded by a copious gelatine*. *Favellidia* *immersed*.

LXXIV. CRUORIA. *Fron*d crustaceous, skin-like.



- LXXV. NACCARIA. *Frond* filiform, solid, cellular; the ramuli (only) composed of radiating, free filaments.
- LXXVI. GLOIOSIPHONIA. *Frond* tubular; the walls composed of radiating filaments.
- LXXVII. NEMALEON. *Frond* filiform, solid, elastic; the *axis* composed of closely packed, vertical filaments; the periphery of moniliform, free, horizontal filaments.
- LXXVIII. DUDRESNAIA. *Frond* filiform, solid, gelatinous; the axis composed of a net-work of anastomosing vertical filaments; the periphery of moniliform, free, horizontal filaments.
- LXXIX. CROUANIA. *Frond* filiform, consisting of a jointed filament (*axis*), whorled at the joints with minute, multifid, moniliform, free, horizontal filaments (or ramelli).

Order 13. CERAMIACEÆ. *Rose-red or purple seaweeds, with a filiform frond, consisting of an articulated, branching filament, composed of a single string of cylindrical cells, sometimes coated with a stratum of smaller polygonal cells. Fructification double: 1. Favellæ, berry-like receptacles, with a membranous coat, containing numerous angular spores. 2. Tetraspores, attached to the ramuli, or subimmersed in their substance, scattered.*

- LXXX. PTILOTA. *Frond* compressed, inarticulate, distichous, pectinato-pinnate. *Favellæ* stalked, involucrate.
- LXXXI. MICROCLADIA. *Frond* filiform, inarticulate, dichotomous. *Favellæ* sessile, involucrate.
- LXXXII. CERAMIUM. *Frond* filiform, articulate, dichotomous; the nodes opaque. *Favellæ* sessile, mostly involucrate. *Tetraspores* immersed or subimmersed.
- LXXXIII. SPYRIDIA. *Frond* filiform, inarticulate; the branches clothed with minute, setiform, articulated ramelli. *Favellæ* stalked, involucrate. *Tetraspores* sessile on the ramelli.
- LXXXIV. GRIFFITHSIA. *Frond* articulated, dichotomous, or clothed with whorled, dichotomous ramelli. *Favellæ* involucreted, sessile, or stalked. *Tetraspores* sessile, on whorled ramelli.
- LXXXV. WRANGELIA. *Frond* articulated, pinnate. *Favellæ* terminal, involucreted, containing tufts of pear-shaped spores. *Tetraspores* sessile, scattered.
- LXXXVI. SEIROSPORA. *Frond* articulated. *Tetraspores* disposed in terminal, moniliform strings.
- LXXXVII. CALLITHAMNION. *Frond* (at least the branches and ramuli) articulate, mostly pinnate. *Favellæ* terminal or lateral, sessile, without involucre (except in *C. Turneri*) *Tetraspores* sessile or pedicellate, scattered.

### SUB-CLASS III. CHLOROSPERMEÆ OR CONFERVALES.

(Grass-green\* Seaweeds.)

Order 14. SIPHONACEÆ. *Green, marine, or fresh-water Algæ, composed of continuous, tubular, simple, or branched filaments (elongated cylindrical cells), free, or variously combined in cylindrical or expanded fronds.*

- LXXXVIII. CODIUM. *Filaments* combined into a spongy frond.
- LXXXIX. BRYOPSIS. *Filaments* free, pinnated.

\* A few *Ulvaceæ* and *Oscillatoriaceæ* are purple.

XC. VAUCHERIA. *Filaments* free, dichotomous or irregular.

Order 15. CONFERVACEÆ. *Green, marine, or fresh-water Algæ, composed of articulated filaments, simple or branched, free or invested by gelatine. Cells cylindrical, truncate.*

Sub-order 1. CONFERVEÆ. *Filaments* free, destitute of gelatine.

XCI. CLADOPHORA. *Filaments* tufted, branched.

XCII. RHIZOCLONIUM. *Filaments* decumbent, subsimple, emitting a few root-like branches.

XCIII. CONFERVA. *Filaments* unbranched.

Sub-order 2. CHÆTOPHOREÆ. *Filaments* united in submembranaceous or gelatinous fronds; cells often tipped with bristles. Sporangia external.

XCIV. OCHLOCHÆTE. *Frond* disciform. *Filaments* radiating from a central point, prostrate, irregularly branched; each cell produced above into a rigid, inarticulate bristle.

Order 16. ULVACEÆ. *Green, or rarely purple, marine or fresh-water Algæ, composed of small polygonal cells, forming expanded membranes, or membranous tubes; very rarely arranged in filaments.*

XCV. ENTEROMORPHA. *Frond* tubular.

XCVI. ULVA. *Frond* flat, green.

XCVII. PORPHYRA. *Frond* flat, purple.

XCVIII. BANGIA. *Frond* filiform (mostly), purple or pink.

Order 17. OSCILLATORIACEÆ. *Green or blue, rarely purple, marine or (more frequently) fresh-water Algæ, composed of continuous, tubular, simple, or rarely branching filaments, which are either free or invested with gelatine. Endochrome annulated, at length separating into lenticular sporidia.*

Sub-order 1. RIVULARIÆ. *Filaments* united together into a solid gelatinous or cartilaginous frond.

XCIX. RIVULARIA. *Filaments* not sheathed.

C. SCHIZOSIPHON. *Filaments* sheathed; the sheath multified.

Sub-order 2. OSCILLATORIÆ. *Filaments* tufted or stratified, free.

CI. SCHIZOTHRIX. *Filaments* rigid, in branching bundles, at length splitting.

CII. CALOTHRIX. *Filaments* short, tufted, fixed at the base only.

CIII. LYNGBYA. *Filaments* elongate, decumbent, flaccid.

CIV. MICROCOLEUS. *Filaments* needle-shaped, several enclosed together in membranous or gelatinous sheaths.

CV. OSCILLATORIA. *Filaments* needle-shaped, straight, or slightly curved, short, heaped together in gelatinous strata, oscillating.

CVI. SPIRULINA. *Filaments* spirally twisted, lying in a mucous stratum, vividly oscillating.

Order 18. NOSTOCHACEÆ. *Green, fresh-water or rarely marine Algæ, composed of moniliform filaments, lying in a gelatinous matrix. Cells globose or oval.*

CVII. MONORMIA. A single filament enclosed in a convoluted gelatinous and branching frond.



CVIII. SPHÆROZYGA. *Filaments* free, separate, naked.

CIX. SPERMOSIRA. *Filaments* free, separate; each enclosed in a very delicate, membranous, filiform tube.

Order 19. PALMELLACEÆ.

Sub-order. HORMOSPOREÆ. Cells *contained in confervoid, simple or branching tubular filaments*.

CX. HORMOSPORA.



# SYNOPSIS OF THE SPECIES.

## I. MELANOSPERMEÆ.

### Order 1. FUCACEÆ.

#### I. SARGASSUM.

1. **vulgare**; stem filiform, alternately branched; leaves lanceolate, serrated, strongly ribbed, glandular; air-vessels on compressed stalks, spherical, pointless; receptacles axillary, unarmed. (TAB. CCCXLIII.)
2. **bacciferum**; leaves linear-lanceolate, very narrow, without pores; air-vessels spherical, mucronate. (TAB. CIX.)

#### II. HALIDRYS.

3. **siliquosa**; branches linear; air-vessels compressed, linear-lanceolate, slightly constricted at the septa, mucronate. (TAB. LXVI.)

#### III. CYSTOSEIRA.

4. **ericoides**; stem short, bearing numerous decompose branches, which are densely clothed with short, spine-like ramuli; air-vessels small, solitary; receptacles armed. (TAB. CCLXV.)
5. **granulata**; branches bulbous at the base; receptacles elongate, without mucro. (TAB. LX.)
6. **barbata**; branches bulbous at the base; receptacles short, mucronate. (TAB. CCCLX.)
7. **foeniculacea**; branches slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, one or two together; receptacles minute, smooth, linear-lanceolate. (TAB. CXXII.)
8. **fibrosa**; branches slender, bi-tri-pinnate; pinnules set with setaceous ramuli; vesicles elliptical, solitary or in pairs; receptacles very long, set with spine-like processes. (TAB. CXXXIII.)

#### IV. PYCNOPHYCUS.

9. **tuberculatus**. (TAB. LXXXIX.)

#### V. FUCUS.

10. **vesiculosus**; frond flat, midribbed, dichotomous, entire; air-vessels in pairs or absent; receptacles turgid, terminal. (TAB. CCIV.)
11. **ceranoides**; frond plane, coriaceous-membranaceous, entire, midribbed, without vesicles, dichotomous, with lateral narrow, dichotomous, fastigate, fertile branches. (TAB. CCLXXI.)
12. **serratus**; frond flat, midribbed, serrated, without air-vessels. (TAB. XLVII.)



13. **nodosus** ; frond compressed, dichotomo-pinnate ; branches strap-shaped, attenuated at the base, remotely toothed and here and there swelling into oblong air-vessels, wider than the frond ; receptacles lateral, ovate, stalked. (TAB. CLVIII.)
14. **Mackaii** ; cylindrical or compressed, dichotomous ; air-vessels elliptical, solitary ; receptacles lateral, stalked, pendulous, near the base of the dichotomous branches. (TAB. LII.)
15. **canaliculatus** ; frond narrow, channelled, without midrib or air-vessels, dichotomous. (TAB. CCXXIX.)

## VI. HIMANTHALIA.

16. **lorea** ; frond top-shaped ; receptacles repeatedly forked. (TAB. LXXVIII.)

## Order 2. SPOROCHNACEÆ.

## VII. DESMARESTIA.

17. **ligulata** ; flat, obscurely midribbed, repeatedly pinnate ; pinnæ and pin-nulæ opposite, lanceolate. (TAB. CXV.)
18. **aculeata** ; branches compressed, slender, bi-tri-pinnate ; pinnæ and pin-nulæ alternate, margined with subulate spines. (TAB. XLIX.)
19. **viridis** ; frond filiform, repeatedly pinnate ; pinnæ and pinnulæ capillary, exactly opposite, patent. (TAB. CCCXII.)

## VIII. ARTHROCLADIA.

20. **villosa**. (TAB. LXIV.)

## IX. SPOROCHNUS.

21. **pedunculatus** ; stem undivided ; branches lateral, simple ; receptacles elliptical. (TAB. LVI.)

## X. CARPOMITRA.

22. **Cabrerae** ; irregularly dichotomous, linear, narrow, flat, midribbed ; branches here and there constricted. (TAB. XIV.)

## Order 3. LAMINARIACEÆ.

## XI. ALARIA.

23. **esculenta** ; frond lanceolate ; midrib narrow, cylindrical ; leaflets linear-oblong or wedge-form. (TAB. LXXIX.)

## XII. LAMINARIA.

24. **digitata** ; stipe cylindrical or compressed, elongate ; lamina deeply cleft into many linear segments. (TAB. CCXXIII.)  
24.\* Var. *stenophylla*, TAB. CCCXXXVIII.
25. **bulbosa** ; stipes flat, with a wavy margin, twisted at the base, rising from a hollow, warted tuber ; frond deeply cleft into linear segments. (TAB. CCXLI.)
26. **longicruris** ; stipes very long, slender at the base, hollow and inflated in the middle, tapering to the apex ; lamina undivided, membranaceous, oblong. (TAB. CCCXXXIX.)

27. **saccharina** ; stem filiform, solid, expanding into a cartilagineo-coriaceous, lanceolate frond. (TAB. CCLXXXIX.)
28. **Phyllitis** ; stipe short, subcompressed, gradually expanding into a linear-lanceolate, delicately membranous, undivided frond. (TAB. CXCII.)
29. **Fascia** ; stipe very short, setaceous, ending in a membranaceous, wedge-shaped or lanceolate frond. (TAB. XLV.)

## XIII. CHORDA.

30. **filum** ; frond filiform, very long, not constricted at the joints. (TAB. CVII.)
31. **lomentaria** ; frond membranous, constricted at distant intervals, the interstices inflated. (TAB. CCLXXXV.)

## Order 4. DICTYOTACEÆ.

## XIV. CUTLERIA.

32. **multifida** ; polymorphous, flabelliform, irregularly cleft ; laciniae acute, attenuate. (TAB. LXXV.)

## XV. HALISERIS.

33. **polypodioides** ; frond dichotomous, entire ; spots of fructification linear, disposed along the midrib. (TAB. XIX.)

## XVI. PADINA.

34. **Pavonia**. (TAB. XCI.)

## XVII. ZONARIA.

35. **collaris** ; procumbent, coriaceous, attached by the under surface ; upper surface emitting cup-shaped, membranaceous, orbicular fronds, fringed round the margin. (TAB. CCCLIX.)
36. **parvula** ; procumbent, attached by fibres from the lower surface, membranaceous, variously lobed ; lobes free, rounded. (TAB. CCCXLI.)

## XVIII. TAONIA.

37. **atomaria** ; frond broadly wedge-shaped, deeply and irregularly cleft longitudinally ; spores in wavy transverse lines, with intermediate scattered spores. (TAB. I. *Dictyota atomaria*.)

## XIX. DICTYOTA.

38. **dichotoma** ; frond regularly dichotomous, the upper segments narrower. (TAB. CIII.)

## XX. STILOPHORA.

39. **rhizodes** ; subsolid, much and irregularly branched ; the lesser divisions dichotomous, attenuated ; wart-like fructification densely covering the branches and ramuli. (TAB. LXX.)
40. **Lyngbyæi** ; frond tubular, distended, dichotomous, with rounded axils, much attenuated upwards ; ramuli forked, capillary ; sori subdistant, in transverse lines. (TAB. CCXXXVII.)

## XXI. DICTYOSIPHON.

41. **fœniculaceus**. (TAB. CCCXXVI.)



## XXII. STRIARIA.

42. **attenuata**; branches and ramuli mostly opposite, tapering to each extremity. (TAB. XXV.)

## XXIII. PUNCTARIA.

43. **latifolia**; oblong or obovate, pale green, blunt, suddenly tapering at the base into a minute stipe. (TAB. VIII.)  
 44. **plantaginea**; frond brownish-olive, cuneate at the base. (TAB. CXXVIII.)  
 45. **tenuissima**; frond sublinear, very thin and transparent. (TAB. CCXLVIII.)

## XXIV. ASPEROCOCCUS.

46. **compressus**; frond compressed, flat, linear-lanceolate, obtuse; sori oblong. (TAB. LXXII.)  
 47. **Turneri**; stipe filiform, suddenly expanding into an inflated, obtuse, delicately membranaceous, bag-like frond. (TAB. XI.)  
 48. **echinatus**; cylindrical or clavate, much attenuated at the base. (TAB. CXCIV.)

## XXV. LITOSIPHON.

49. **pusillus**; fronds filiform, very long, clothed with pellucid hairs; spores scattered. (TAB. CCLXX.)  
 50. **Laminariæ**; fronds short, stellately tufted, smooth, transversely banded, bands close together; spores scattered. (TAB. CCXCV.)

## Order 5. CHORDARIACEÆ.

## XXVI. CHORDARIA.

51. **flagelliformis**; branches lateral, subsimple, filiform, naked; peripheric filaments club-shaped. (TAB. CXI.)  
 52. **divaricata**; irregularly divided; branches subdichotomous, flexuous, having short, very patent, forked, scattered ramuli; peripheric filaments capitate. (TAB. XVII.)

## XXVII. MESOGLOIA.

53. **vermicularis**; frond unequally distended, clumsy; branches irregularly pinnate, worm-like, thickened in the middle; ramuli copious. (TAB. XXXI.)  
 54. **Griffithsiana**; frond slender, equal; branches scattered, filiform, long, simple, nearly bare. (TAB. CCCXVIII.)  
 55. **virescens**; frond filiform, gelatinous; branches long, slender, villous; ramuli numerous, patent, short, linear, obtuse. (TAB. LXXXII.)

## XXVIII. LEATHESIA.

56. **tuberiformis**; fronds at first stuffed with cottony fibres, at length hollow. (TAB. CCCXXIV.)  
 57. **Berkeleyi**; dark brown, depressed, solid. (TAB. CLXXVI.)

## XXIX. RALFSIA.

58. **verrucosa**, Aresch.; frond orbicular, adhering by its whole under surface, warted in the middle. (TAB. XCVIII. *R. deusta*.)  
 (*Ralfsia deusta*, J. Ag., founded on the original *Zonaria deusta* of Agardh, is a different species.)

## XXX. ELACHISTA.\*

59. **fucicola**; tufts pencilled; filaments long, attenuated upwards; articulations once or twice as long as broad. (TAB. CCXL.)
60. **flaccida**; tufts pencilled; filaments long, flaccid, much attenuated at the base, the lower articulations half as long as broad, the upper of equal length and breadth. (TAB. CCLX.)
61. **curta**; filaments very short, club-shaped, rather rigid, rising from a tubercle; articulations as long as broad; spores pear-shaped. (TAB. CCCXXXII.)
62. **stellulata**; tufts very minute, stellate; filaments tapering at the base, slightly clavate, obtuse; articulations twice as long as broad, uniform. (TAB. CCLXI.)
63. **scutulata**; filaments short, rising from an oblong, convex, shield-like tubercle, composed of densely packed, dichotomous fibres; articulations 2-3 times as long as broad; spores oblong. (TAB. CCCXXXIII.)
64. **pulvinata**; tufts very minute, globose; filaments much tapered to both ends, the basal joints 3-4 times, the middle  $1\frac{1}{2}$ , the apical as long as broad. (TAB. XXVIII. *A.* *E. attenuata.*)
65. **velutina**; spreading in thin, indefinite velvety patches; filaments very minute, filiform; spores elliptical, pedicellate. (TAB. XXVIII. *B.*)

## XXXI. MYRIONEMA.

66. **strangulans**; patches convex, confluent; vertical filaments clavate, densely set; spores obovate, on short stalks, rising from the decumbent filaments. (TAB. CCLXXX.)
67. **Leclancherii**; patches orbicular, thin at the edges, convex in the centre; spores on long pedicels. (TAB. XLI. *A.*)
68. **punctiforme**; patches globose; spores affixed to the vertical filaments, near their base. (TAB. XLI. *B.*)
69. **clavatum**; very minute, rather convex; filaments clavate, mostly bifid; spores obovate, pedicellate, affixed to the filaments. (TAB. CCCXLVIII.)

## Order 6. ECTOCARPACEÆ.

## XXXII. CLADOSTEPHUS.

70. **verticillatus**; branches slender; ramuli mostly forked, subdistant, regularly whorled. (TAB. XXXIII.)
71. **spongiosus**; branches thick and clumsy; ramuli mostly simple, irregularly whorled and densely imbricated. (TAB. CXXXVIII.)

## XXXIII. SPHACELARIA.

72. **filicina**; shaggy at the base; stem slender, irregularly divided; branches lanceolate, erecto-patent, bi-tri-pinnate; pinnæ erect; pinnules multifid; all the axils very acute and narrow. (TAB. CXLII.)
73. **Sertularia**; slightly shaggy at the base; stem weak and slender, irregularly divided; branches linear, horizontally patent, tripinnate; pinnæ divaricate; pinnules multifid; all the axils very obtuse and wide. (TAB. CXLIII.)
74. **scoparia**; coarse and of large size, shaggy at the base; upper branches once or twice pinnated; pinnæ erecto-patent, awl-shaped, the lower ones pinnulate. (TAB. XXXVII.)

\* Incorrectly spelt *Elachistea* in the body of the work.



75. **plumosa** ; filaments naked at the base, long, irregularly divided, inarticulate; branches pectinato-pinnate; pinnæ opposite, closely set, simple. (TAB. LXXXVII.)
76. **cirrhusa** ; parasitical, naked at the base; filaments short, densely tufted, jointed throughout, simple or divided; branches pinnate; pinnæ opposite or irregular, of unequal length. (TAB. CLXXVIII.)
77. **fusca** ; densely tufted, capillary, distantly and irregularly branched; branches very erect, subsimple; ramuli few, scattered, club-shaped or three-pronged; articulations twice as long as broad. (TAB. CXLIX.)
78. **radicans** ; filaments erect, or decumbent and rooting, sparingly branched; branches simple, scattered, erect, naked; spores clustered, sessile, globose. (TAB. CLXXXIX.)
79. **racemosa** ; spores pedunculate, in compound racemose, lateral clusters. (TAB. CCCXLIX.)

## XXXIV. ECTOCARPUS.

80. **siliculosus** ; tufts soft, yellowish-olive; filaments very slender, excessively branched; ultimate branchlets alternate; propagula stalked, subulate, attenuate to a fine point. (TAB. CLXII.)
81. **amphibius** ; tufts short, soft, pale olive; filaments subdichotomous; ramuli scattered, subulate; articulations twice or thrice as long as broad; propagula linear-attenuate, mostly sessile. (TAB. CLXXXIII.)
82. **fenestratus** ; pale olive-green, very slender, in small tufts; branches alternately and laxly decompound; articulations twice or thrice as long as broad; propagula stalked, at first clavate, afterwards elliptic-oblong, obtuse. (TAB. CCLVII.)
83. **fasciculatus** ; tufts olivaceous, dense; branches set with alternate or secund fascicles of minute, secund ramuli; propagula sessile, secund, close together, ovate-acuminate or subulate. (TAB. CCLXXXIII.)
84. **Hincksiae** ; tufted; filaments irregularly branched; branches flexuous, set with secund ramuli which are pectinated along their upper side; utricles conical, lining the inner face of the ultimate ramuli. (TAB. XXII.)
85. **tomentosus** ; filaments interwoven into a sponge-like, branching frond; ramuli few; propagula stalked, linear-oblong or fusiform, obtuse. (TAB. CLXXXII.)
86. **crinitus** ; filaments long, decumbent, stratified, sparingly branched; branches subsimple, distant; ramuli few, patent; spores globose, scattered, sessile; articulations twice or thrice as long as broad. (TAB. CCCXXX.)
87. **pusillus** ; filaments tufted, interwoven, sparingly branched; branches distant, patent; ramuli few, divaricating; spores roundish-oblong, subsessile, frequently opposite. (TAB. CLIII.)
88. **distortus** ; filaments densely matted, angularly bent, flaccid and fragile; branches divaricated, alternate or secund; ramuli horizontally patent, recurved, obtuse; spores obovate, subsessile. (TAB. CCCXXIX.)
89. **Landsburgii** ; tufts intricate, small; filaments tenacious, zigzag, divaricately much branched; branches bristling with spine-like horizontal ramuli; articulations shorter than broad; dissepiments very narrow. (TAB. CCXXXIII.)
90. **littoralis** ; tufts dense, interwoven, olive-brown; filaments coarse, much branched; ultimate branchlets patent, alternate or opposite; propagula forming oblong swellings in the branches. (TAB. CXC VII.)

91. **longifructus**; tufts large and feathery; filaments robust, excessively branched, decompound; branches mostly opposite, with short, spine-like ramuli; articulations as long as broad; propagula very long, linear-lanceolate, terminating the branches and ramuli. (TAB. CCLVIII.)
92. **granulosus**; olive, robust, slightly entangled; branches free, repeatedly divided; lesser branches and ramuli opposite, spreading; spores elliptical, dark-coloured, sessile. (TAB. CC.)
93. **sphærophorus**; filaments densely tufted, much branched; upper branches patent, opposite or in fours, having opposite, patent ramuli; spores globose, sessile, opposite one to the other, or to a branchlet. (TAB. CXXVI.)
94. **brachiatus**; branches opposite or quaternate, spreading; ramuli opposite, patent; propagula forming oblong swellings in the nodes of the lesser branches. (TAB. IV.)
95. **Mertensii**; distichous; branches opposite, of unequal length, closely set with short, slender, opposite ramuli; spores binate, immersed in the ramuli. (TAB. CXXXII.)

## XXXV. MYRIOTRICHIA.

96. **clavæformis**; frond clavate; ramuli gradually longer upwards. (TAB. CI.)
97. **filiformis**; filiform, slender, beset at irregular intervals with oblong clusters of short ramuli. (TAB. CLVI.)

## II. RHODOSPERMEÆ.

## Order 7. RHODOMELACEÆ.

## XXXVI. ODONTHALIA.

98. **dentata**; frond irregularly pinnate; branches deeply pinnatifid; laciniae alternate, sharply toothed toward their truncate extremities. (TAB. XXXIV.)  
*(The colour on the plate is incorrect. This plant is of a deep blood-red colour when growing, but becomes dark on exposure to the air.)*

## XXXVII. RHODOMELA.

99. **lycopodioides**; divided near the base into several, long, simple branches, which are densely set with multifid, slender ramuli. (TAB. L.)
100. **subfusca**; much branched; branches irregularly decompound, and clothed with pinnated branchlets mixed with scattered subulate ramuli; pinnules subulate. (TAB. CCLXIV.)

## XXXVIII. BOSTRYCHIA.

101. **scorpioides**; frond flexuous, forked; branches bi-tri-pinnate; pinnæ and pinnulæ patent; apices strongly rolled inwards. (TAB. XLVIII.)

## XXXIX. RYTIPHLÆA.

102. **pinastroides**; frond terete; lesser branches pectinato-pinnate, the pinnæ secund, with their tips inflexed. (TAB. LXXXV.)
103. **complanata**; brown-red, compressed, pinnate or bi-tri-pinnate; pinnules subulate, erect; axils very acute. (TAB. CLXX.)
104. **thuyoides**; stems terete, erect, alternately branched; branches erect, vir-



gate, pinnulate or bipinnulate, the pinnules short; capsules sessile. (TAB. CCXXI.)

105. **fruticulosa**; stems terete, diffuse, branched from the base; branches divaricating, pinnato-dichotomous, with short multifid ramuli; axils rounded; capsules sessile. (TAB. CCXX.)

#### XL. POLYSIPHONIA.

\* *Primary tubes 4-5; frond distinctly jointed throughout.*

106. **urceolata**; rigid, setaceous, full-red, loosely bundled; branches dichotomous, with scattered patent or reflexed ramuli; articulations 3-5 times as long as broad; dissepiments pellucid; capsules pitcher-shaped, constricted at the mouth. (TAB. CLXVII.)

107. **formosa**; flaccid, exceedingly slender, full red, densely tufted; branches dichotomous, with scattered, patent ramuli; articulations 5-10 times as long as broad; dissepiments pellucid; capsules pitcher-shaped, constricted at the mouth. (TAB. CLXVIII.)

(*P. stricta*, Harv. Man. p. 83, seems to be the young of this species?)

108. **pulvinata**; densely tufted; filaments creeping, throwing up erect, irregularly dichotomous stems, whose branches bear a few short, recurved ramuli; articulations 3-4 times as long as broad; capsules urn-shaped, stalked. (TAB. CII. B.)

109. **fibrata**; setaceous below, attenuated and capillary above, flaccid, gelatinous, alternately branched, with dichotomous, pencilled lesser branches, whose tips are remarkably fibrilliferous; axils patent; articulations of the branches 4-6 times longer than broad; capsules ovate, stalked. (TAB. CCVIII.)

110. **spinulosa**; articulate throughout; rigid, branched from the base, branches divaricate, decompound; ramuli short, spine-like, spreading; articulations as long as broad, three-striate. (TAB. CCCXX.)

111. **Richardsoni**; stem cartilaginous, setaceous; branches alternate, long, divaricated, set above with very patent, straight, forked ramuli; articulations 2-3 times longer than broad, veiny; tubes 5; capsules sessile, broadly ovate. (TAB. X.)

112. **Griffithsiana**; stem alternately branched, rigid; branches subsimple, with dichotomous or alternately multifid pencilled, slender ramuli; articulations once and half as long as broad, 3-4-striate; siphons four primary, with four external, secondary; capsules sessile. (TAB. CCXXVIII.)

113. **elongella**; setaceous, rigid below, flaccid above, dichotomous, with very patent axils; upper branches decomposed into multifid, pencilled, rose-red ramuli; articulations about as long as broad, 2-3-striate, the tubes very wide and dissepiments pellucid; capsules ovate, stalked. (TAB. CXLVI.)

\* \* *Primary tubes 4; stem and branches subopake, or inarticulate.*

114. **elongata**; robust, cartilaginous, irregularly divided; ramuli pencilled, capillary, multifid, attenuated at base and apex; articulations once and half as long as broad, those of the stem and branches reticulated with veins; siphons four. (TAB. CCXCII. and CCXCIII.)

115. **violacea**; brown-red, purple, or sanguineous; stem inarticulate, veiny, robust, alternately branched; branches decompound, feathery, the ultimate ramuli very slender, multifid, fibrilliferous; articulations of the ramuli two-striate, 2-4 times as long as broad; capsules ovate. (TAB. CCIX.)

(*P. Grevillei*, Harv. Man. ed. 2. p. 86, I now consider to be merely a variety of this species, more sanguineous than usual.)

116. **Carmichaeliana**; stem inarticulate, percurrent, flexuous, rigid; branches lateral, divaricating; ramuli scattered, very patent, spinoso-multifid, articulate; articulations as long as broad, three-striate. (TAB. CCCXIX.)

117. **fibrillosa**; pale straw-colour or brown; stems inarticulate, marked with sinuous veins, robust, much branched; branches articulated near the apices only, beset with slender, finely divided, articulated ramuli; tips copiously fibrillose; articulations rather longer than their breadth; siphons four. (TAB. CCCII.)

\* \* \* *Primary tubes 7; stem inarticulate.*

118. **Brodiaei**; stems inarticulate, robust; branches virgate, clothed with pencilled, multifid, flaccid, articulated ramuli; articulations of the ramuli 3-4-striate, longer than broad; siphons seven; capsules ovate, pedicellate. (TAB. CXCV.)

\* \* \* \* *Primary tubes 6-7; frond jointed throughout.*

119. **variegata**; brownish-purple, setaceous, rigid below, flaccid and capillary above, dichotomous, the lower axils patent; branches decompound; lower articulations very short, middle twice as long as broad, each marked with three broad, oblong cells, separated by pellucid spaces; siphons 6-7; capsules ovate, stalked. (TAB. CLV.)

\* \* \* \* \* *Primary tubes 8-20; frond jointed throughout.*

120. **obscura**; densely matted, short; filaments creeping, throwing up erect, simple, secund branches; articulations short. (TAB. CII. A.)

121. **simulans**; slender, bushy, branched from the base; branches patent, decompoundly but irregularly pinnate; ramuli subulate; articulations once and half as long as broad; siphons about twelve; capsules ovate, sessile. (TAB. CCLXXVIII.)

122. **nigrescens**; robust, rigid, and rough with broken branches below, much branched and flaccid above; branches decompoundly pinnate; ramuli subulate; lower articulations short, upper once and half as long as broad; siphons about twenty; capsules sessile, ovate. (TAB. CCLXXVII.)

123. **affinis**; filaments elongate, rigid below, flaccid above; branches naked at the base, multifid and decompound pinnate above; ramuli very erect, subulate; articulations multistriate, the lower 2-3 times as long as broad, upper gradually shorter; siphons about sixteen. (TAB. CCCIII.)

124. **subulifera**; setaceous, flexuous, irregularly much branched; branches alternately decompound, spreading, the lesser divisions virgate; ramuli scattered, subulate, patent; siphons about thirteen. (TAB. CCXXVII.)

125. **atrorubescens**; setaceous, dark brownish-red, rigid, alternately branched; branches long, very erect, once or twice compounded; ramuli scattered, tapering to base and apex, simple or divided; articulations of stem 2-3 times as long as broad, of branches shorter, many-striate, the striæ curved; siphons about twelve; capsules broadly ovate. (TAB. CLXXII.)

126. **furcellata**; filaments elongated, flexuous, dichotomous; axils broad, rounded; ramuli multifid; articulations 3-5 times longer than broad. (TAB. VII.)

127. **fastigiata**; rigid, setaceous, dichotomous, fastigate; articulations shorter than their breadth; siphons 16-18. (TAB. CCXCIX.)



128. **parasitica**; distichous, rigid, slender, full red, bi-tri-pinnate; pinnules closely set, alternate, subulate, acute; articulations about as long as broad, each marked with 3 or 4 broad, hexagonal cells, separated by pellucid spaces; capsules ovate, stalked. (TAB. CXLVII.)
129. **byssoides**; stems rigid, setaceous, distichously pinnate; branches patent, decompound, clothed with dichotomous single-tubed byssoid ramelli; articulations variable in length; siphons seven. (TAB. CCLXXXIV.)

#### XLI. DASYA.

130. **coccinea**; stems robust, rough with hair-like fibres, distichous; branches bi-tri-pinnate; pinnæ multifid, single-tubed, their articulations as long as broad. (TAB. CCLIII.)
131. **ocellata**; stems subsimple; ramelli quadrifarious, dichotomous, erecto-patent; stichidia linear-lanceolate, tapering to a point. (TAB. XL.)
132. **Arbuscula**; irregularly much branched; ramelli quadrifarious, dichotomous, patent or divaricate, scarcely attenuated; articulations 2–4 times as long as broad; stichidia elliptic-oblong, mucronate; capsules urceolate, with a long cylindrical neck. (TAB. CCXXIV.)
133. **venusta**; decompoundly pinnate; ramelli quadrifarious, exceedingly slender, many times dichotomous, much attenuated; articulations 5–6 times as long as broad; stichidia pedicellate, ovoid, much acuminate; capsules ovate-urceolate. (TAB. CCXXV.)

#### Order 8. LAURENCIACEÆ.

##### XLII. BONNEMAISONIA.

134. **asparagoides**; frond compressed; capsules stalked, opposite the cilia. (TAB. LI.)

##### XLIII. LAURENCIA.

135. **pinnatifida**; frond compressed, bi-tri-pinnate, the divisions alternate; ramuli linear, erecto-patent, simple or lobed. (TAB. LV.)
136. **cæspitosa**; cylindrical or subcompressed, narrow, repeatedly pinnate, pyramidal; branches and ramuli erecto-patent, scattered, distichous or spreading on all sides, truncate, scarcely tapering at the base. (TAB. CCLXXXVI.)
137. **obtusa**; cylindrical, repeatedly pinnate; branches patent; pinnæ and pinulæ mostly opposite, the ultimate pinnules very short and obtuse. (TAB. CXLVIII.)
138. **dasyphylla**; cylindrical, decompoundly pinnate or irregularly branched; branches erecto-patent; ramuli much attenuated at the base, scattered, very obtuse. (TAB. CLII.)
139. **tenuissima**; frond terete; branches long and virgate, clothed with very slender, short ramuli, which taper at each end. (TAB. CXCVIII.)

##### XLIV. CHRYSYMENIA.

140. **clavellosa**; repeatedly pinnate; ramuli lanceolate, attenuate. (TAB. CXIV.)
141. **rosea**; pinnate or bipinnate; branches elliptic-oblong, compressed; pinnæ opposite, blunt. (TAB. CCCI. and TAB. CCCLVIII. A.)

##### XLV. CHYLOCLADIA.

142. **ovalis**; frond terete, branching, solid; branches clothed with simple, elliptical, jointed, tubular ramuli; capsules spherical. (TAB. CXVIII.)

143. **kaliformis**; pyramidal, erect, with a leading stem, which is distended, constricted at distant intervals, and whorled with articulato-constricted branches; ramuli opposite or whorled, moniliform; capsules globose. (TAB. CXLV.)
144. **reflexa**; dull purple; lower branches cylindrical, arched, attaching themselves by discs; secondary branches moniliform, spindle-shaped; ramuli few, scattered; capsules globose. (TAB. XLII.)
145. **parvula**; slender, irregularly branched; ramuli scattered; branches constricted at short intervals; capsules conical, with a prominent orifice. (TAB. CCX.)
146. **articulata**; frond tubular, strongly constricted throughout as if jointed, much branched, di-trichotomous, fastigate; the upper branches often crowded; capsules obtusely conical. (TAB. CCLXXXIII.)

## Order 9. CORALLINACEÆ.

## XLVI. CORALLINA.

147. **officinalis**; upper articulations slightly obconical, round-edged, their upper angles blunt. (TAB. CCXXII.)
148. (**elongata**; "the lateral shoots of the branches slender and subulate, with long, cylindrical articulations."—*Johnst. Lith.* p. 221.)  
I have seen no specimen of this, and have consequently been obliged to omit figuring it.
149. **squamata**; upper articulations obconical or obcordate, compressed, two-edged, their upper angles sharp and prominent. (TAB. CCI.)

## XLVII. JANIA.

150. **rubens**; articulations cylindrical, unarmed, about four times as long as broad. (TAB. CCLII.)
151. **corniculata**; articulations of the branches obconical, compressed, their upper angles sharp and prominent. (TAB. CCXXXIV.)

## XLVIII. MELOBESIA.

\* *Frond thick and stony, branched or incrusting.*

152. **polymorpha**; attached to rocks, encrusting, thick; the surface smooth or tuberculated; ceramidia minute, depressed. (TAB. CCCXLV.)
153. **calcareæ**; unattached, shrub-like, much branched; branches slender, spreading, tapering to a blunt point. (TAB. CCXCI.)
154. **fasciculata**; frond unattached, roundish or lobed, stony, much branched, fastigate; branches solid, short, thick and crowded; apices depressed. (TAB. LXXIV.)

\* \* *Frond thin, foliated, free or partially attached to rocks.*

155. **agariciformis**; frond unattached, globular, hollow; foliations papery, erect, lobed and sinuated. (TAB. LXXIII.)
156. **lichenoides**; attached to rocks, free at the margins, foliaceous, variously lobed; foliations spreading, imbricated; ceramidia conical, prominent. (TAB. CCCXLVI.)

\* \* \* *Frond minute, parasitic.*

157. **membranacea**; minute, dot-like, very thin, at length confluent; ceramidia one or two, depressed. (TAB. CCCXLVII. A.)



158. **farinosa**; minute, irregular in outline, rather thin, pallid, with 2-3 prominent ceramidia. (TAB. CCCXLVII. *B.*)
159. **verrucata**; thin, expanded, irregularly lobed, pallid, dotted over with minute, pimply ceramidia. (TAB. CCCXLVII. *C.*)
160. **pustulata**; thick, dull purple or green, oblong, incrusting; ceramidia numerous, large, prominent, conical. (TAB. CCCXLVII. *D.*)

## XLIX. HILDENBRANDTIA.

161. **rubra**. (TAB. CCL.)

## L. HAPALIDIUM.

162. **Phyllactidium**, Kütz.; flabelliform, variously lobed, colourless. (*Lithocystis Allmanni*, TAB. CLXVI.)

Common on Algæ round the British coasts; and, according to Kützing, found abundantly in the Mediterranean and in New Holland. Our figure represents the young plant, which afterwards becomes much more lobed and expanded.

## Order 10. DELESSERIACEÆ.

## LI. DELESSERIA.

163. **sanguinea**; stem short, cartilaginous, bearing oblong, transversely veined, entire, undulate leaves; veinlets opposite. (TAB. CLI.)
164. **sinuosa**; stem branched, bearing oblong or ovate, deeply sinuate or pinatifid, toothed, pennate-ribbed leaves; nerves opposite. (TAB. CCLIX.)
165. **alata**; stem dichotomous, decompoundly branched, winged throughout with a narrow, membranous, pennate-nerved lamina. (TAB. CCXLVII.)
166. **angustissima**; frond very narrow, compressed, two-edged, distichously much branched, destitute of membrane. (TAB. LXXXIII.)
167. **Hypoglossum**; frond linear-lanceolate, repeatedly proliferous from the midrib with leaflets of similar form; leaflets acute. (TAB. II.)
168. **ruscifolia**; frond linear-oblong, repeatedly proliferous from the midrib with leaflets of similar form; leaflets round at the apex. (TAB. XXVI.)

## LII. NITOPHYLLUM.

169. **punctatum**; frond very thin and delicate, nerveless, more or less regularly dichotomous, rose-red; axils rounded; sori large, oblong, scattered over the whole surface. (TAB. CCII. and CCIII.)
170. **Hilliæ**; frond thickish, veiny toward the base, roundish, irregularly cleft; segments oblong, obtuse; sori very minute, dot-like, densely scattered over the surface of the frond. (TAB. CLXIX.)
171. **Bonnemaisoni**; frond shortly stalked, fan-shaped, variously cleft; segments wedge-shaped; spots of granules minute, roundish, scattered over the surface. (TAB. XXIII.)
172. **Gmelini**; frond crisp, stipitate, veined at the base, fan-shaped, vaguely cleft; segments broadly wedge-shaped, waved, and curled; sori linear, marginal. (TAB. CCXXXV.)
173. **laceratum**; frond subsessile, rigidly membranous, traversed by branching veinlets, dichotomous; segments linear or cuneate, waved at the margin, obtuse; sori oblong, marginal. (TAB. CCLXVII.)

174. **versicolor**; stipitate; frond fan-shaped, circumscribed, subdichotomous or irregularly cleft, veinless, incrassated at the base; segments rounded. (TAB. IX.)

LIII. **PLOCAMIUM.**

175. **coccineum**; frond narrow, plano-compressed; ramuli subulate, secund, 3 or 4 consecutively; pectinate on their inner edges. (TAB. XLIV.)

## Order 11. RHODYMENIACEÆ.

LIV. **STENOGRAMME.**

176. **interrupta**; stipitate, membranaceous, flabelliform, dichotomously cleft; apices obtuse; conceptacles forming a nerve-like line through the centre of each lobe. (TAB. CLVII.)

LV. **RHODYMENIA.**

177. **bifida**; thin and semitransparent, dichotomous; segments linear or cuneate; apices obtuse; tubercles mostly marginal, sessile; tetraspores transversely zoned. (TAB. XXXII.)
178. **laciniata**; frond thickish, subopake, bright red, flabelliform, deeply cleft; segments wedge-shaped, obtuse; margin curled and fringed with minute processes in which the tubercles are imbedded. (TAB. CXXI.)
179. **Palmetta**; stipes cylindrical, elongate, expanding into a fan-shaped, rose-red, dichotomously cleft frond; segments linear, with rounded interstices; margin entire, flat; tubercles sessile, marginal or scattered; sori elliptical, solitary in the expanded apices. (TAB. CXXXIV.)
180. **cristata**; fan-shaped, membranaceous, deeply lacinate; segments dilated upwards, repeatedly divided; lesser divisions lacinate at the ends and often fimbriate; tubercles spherical, marginal, sessile. (TAB. CCCVII.)
181. **ciliata**; frond thick, subopake, dull purplish-red, shortly stipitate, lanceolate or forked, irregularly pinnated with lanceolate or bifid segments; margin fringed with subulate processes, in which tubercles are imbedded. (TAB. CXXVII.)
182. **jubata**; frond thickish, flaccid, dull red, linear-lanceolate, cirrhose at the apex, pinnatifid; margin and often the disc beset with filiform processes. (TAB. CLXXV.)
183. **palmata**; frond coriaceous or membranaceous, dull purple, broadly wedge-shaped, irregularly cleft, palmate or dichotomous, sometimes lacinate, and very narrow; margin flat and even, simple or winged with leaflets; sori cloud-like, dispersed. (TAB. CCXVII. and CCXVIII.)

LVI. **SPHÆROCOCCLUS.**

184. **coronopifolius**; much branched; branches alternate or subdichotomous, multifid; laciniae acute, fringed with cilia; tubercles in the marginal cilia. (TAB. LXI.)

LVII. **GRACILARIA.**

185. **multipartita**; frond flat, tender, purplish-red, deeply cleft, irregularly dichotomous or fingered; branches linear-wedge-shaped; tubercles conical, very prominent, scattered plentifully over the segments. (TAB. XV.)
186. **compressa**; frond succulent, brittle, subcompressed, irregularly branched; branches long, tapering; tubercles prominent, ovate, scattered. (TAB. CCV.)



187. **confervoides**; frond filiform, cartilaginous, irregularly branched or sub-simple; branches elongate, slender; tubercles scattered, sessile, roundish, subacute. (TAB. LXV.)

188. **erecta**; fronds many from a common disc, short, erect, filiform, sparingly branched; tubercles globose, clustered; tetraspores contained in terminal, lanceolate, pod-like ramuli. (TAB. CLXXVII.)

#### LVIII. HYPNEA.

189. **purpurascens**; purplish-red, excessively branched, bushy; branches alternate; ramuli multifid, attenuate; tubercles immersed in the ramuli. (TAB. CXVI.)

### Order 12. CRYPTONEMIACEÆ.

#### LIX. GRATELOUPIA.

190. **flicina**; frond narrow, tapering, once or twice pinnated; pinnæ flexuous. (TAB. C.)

#### LX. GELIDIUM.

191. **corneum**; distichous; branches linear, narrowed at each end, pinnate or bi-tri-pinnate; pinnules opposite or alternate, patent, obtuse. (TAB. LIII.)

192. **cartilagineum**; several times pinnated; pinnæ and pinnulæ erecto-patent, with rounded axils, linear, obtuse. (TAB. CCCXXXVII.)

#### LXI. GIGARTINA.

193. **pistillata**; frond compressed, stipitate, flabellately branched; branches repeatedly forked, with rounded axils, naked or pinnated with short, horizontal ramuli; tubercles solitary or in pairs, on the ramuli. (TAB. CCXXXII.)

194. **acicularis**; cylindrical, irregularly branched, between pinnated and dichotomous; branches divaricating; ramuli few, recurved, subulate; tubercles scattered on the branches. (TAB. CIV.)

195. **Teedii**; frond flaccid, flattish, linear, acuminate, repeatedly pinnate; pinnæ horizontal, set with horizontal, spine-like ramuli. (TAB. CCLXVI.)

196. **mamillosa**; frond fan-shaped, dichotomous, plane, channelled; segments wedge-shaped; tubercles roundish or ovate, pedicellate, scattered over the disc of the frond. (TAB. CXCIX.)

#### LXII. CHONDRUS.

197. **crispus**; frond stipitate, thickish, cartilaginous; the segments wedge-shaped, variable in breadth; apices emarginate; axils obtuse; sori elliptical or oblong, scattered. (TAB. LXIII.)

198. **Norvegicus**; frond linear, dichotomous, flat, dull red; axils patent; apices rounded; favellidia minute, imbedded in the substance; nemathecia scattered over both surfaces. (TAB. CLXXXVII.)

#### LXIII. PHYLLOPHORA.

199. **rubens**; stipe short, expanding into the cuneate base of a narrow, obscurely midribbed, rigid, blood-red frond, which is repeatedly proliferous; tubercles scattered over the surface, wrinkled. (TAB. CXXXI.)

200. **membranifolia**; stem filiform, elongated, branched; branches expanding into broadly wedge-shaped, or fan-shaped, dichotomous dull purple laminæ; tubercles on short stalks, rising from the stem or the laminæ. (TAB. CLXIII.)

201. **Brodiaei**; stem filiform, branched; the branches terminating in forked, membranous leaflets, proliferous at the extremity; tubercles sessile on the tips of the segments. (TAB. XX.)

202. **palmettoides**; root a wide-spread disc; stem filiform, expanding into an oblong or cuneate, simple or once-forked, rose-coloured frond; sorus solitary, transverse, elliptical, immersed below the apex of the frond. (TAB. CCCX.)

#### LXIV. PEYSSONELIA.

203. **Dubyi**; frond membranaceous, orbicular or lobed, attached by the whole of its under surface. (TAB. LXXI.)

#### LXV. GYMNOGONGRUS.

204. **Griffithsiae**; dichotomous, fastigate; warts surrounding the stem. (TAB. CVIII.)

205. **plicatus**; horny, dark purple, entangled, wiry, irregularly branched; branches of various lengths, forked, with very wide axils; warts oblong, irregular, scattered. (TAB. CCLXXXVIII.)

#### LXVI. POLYIDES.

206. **rotundus**. (TAB. XCV.)

#### LXVII. FURCELLARIA.

207. **fastigiata**. (TAB. XCIV. and CCCLVII. A.)

#### LXVIII. DUMONTIA.

208. **filiformis**; frond undivided, attenuated to each extremity, pinnated with long, simple, tapering branches. (TAB. LIX. and CCCLVII. B.)

#### LXIX. HALYMENIA.

209. **ligulata**; frond compressed or flat, irregularly dichotomous or palmate; the segments attenuated. (TAB. CXII.)

#### LXX. GINANNIA.

210. **furcellata**; cylindrical, tender, uniformly dichotomous; apices obtuse. (TAB. LXIX.)

#### LXXI. KALLYMENIA.

211. **reniformis**; stipe short, terete, suddenly expanding into a roundish or irregularly cleft, blood-red frond. (TAB. XIII.)

212. **Dubyi**; stem compressed, gradually expanding into an obovate or cuneated, dull red lamina. (TAB. CXXIII.)

#### LXXII. IRIDÆA.

213. **edulis**; frond obovate. (TAB. XCVII.)

#### LXXIII. CATENELLA.

214. **Opuntia**; root creeping; stems vaguely branched; internodes lanceolate or elliptical, four times as long as broad. (TAB. LXXXVIII.)

#### LXXIV. CRUORIA.

215. **pellita**. (TAB. CXVII.)



## LXXV. NACCARIA.

216. **Wiggii**; frond filiform; branches alternate, repeatedly divided, attenuate; ramuli spindle-shaped, quadrifarious. (TAB. XXXVIII.)

## LXXVI. GIOIOSIPHONIA.

217. **capillaris**. (TAB. LVII.)

## LXXVII. NEMALEON.

218. **multifidum**; frond dichotomous, slightly branched, dull purplish-red; the axils rounded. (TAB. XXXVI.)
219. **purpureum**; stem undivided, attenuate at the base and apex; branches lateral, scattered, tapering, naked or having a second series of similar branchlets. (TAB. CLXI.)

## LXXVIII. DUDRESNAIA.

220. **coccinea**; rosy red, irregularly much branched; branches moniliform, attenuated upwards, decompound. (TAB. CCXLIV.)
221. **divaricata**; pale red, excessively branched; branches horizontal, once or twice pinnated; ramuli divaricating. (TAB. CX.)

## LXXIX. CROUANIA.

222. **attenuata**. (TAB. CVI.)

## Order 13. CERAMIACEÆ.

## LXXX. PTILOTA.

223. **plumosa**; cartilaginous, decompound; secondary branches bi-tri-pinnate; pinnæ and pinnulæ opposite, the latter subulate, inarticulate, but traversed by a jointed midrib; favellæ involucrate, pedicellate. (TAB. LXXX.)
224. **sericea**; flaccid; the pinnulæ articulate, formed of a single row of cells. (TAB. CXCI.)

## LXXXI. MICROCLADIA.

225. **glandulosa**. (TAB. XXIX.)

## LXXXII. CERAMIUM.

\* *Smooth; frond uniformly coloured throughout.*

226. **rubrum**; robust, gradually attenuated, irregularly dichotomous with lateral, forked or multifid ramuli; apices hooked inwards; articulations unarmed, coloured; tetraspores whorled, immersed; favellæ involucrate, on the lateral branchlets. (TAB. CLXXXI.)
227. **botryocarpum**; filaments crooked at the base, robust, attenuated, irregularly dichotomous, with crowded, lateral, mostly simple ramuli; apices straight; articulations coated with cells, unarmed; dissepiments constricted; tetraspores whorled, immersed; favellæ terminating the lateral branchlets, involucrate. (TAB. CCXV.)

(The so-called "*favellæ*" of the text (under Pl. CCXV.) are diseased *tetraspores*.)

\* \* *Smooth; nodes coloured, internodes colourless.*

228. **decurrens**; robust, attenuated, dichotomous, with lateral dichotomous

branchlets; apices hooked inwards; internodes partially clothed with coloured cells, which extend from the nodes, but leave a colourless band in the centre of each internode. (TAB. CCLXXVI.)

229. **Deslongchampsii**; subsetaceous, attenuated, irregularly dichotomous, with or without lateral ramuli; apices straight, spreading; internodes colourless, the lower thrice as long as broad, upper very short; dissepiments purple, scarcely swollen; tetraspores whorled. (TAB. CCXIX.)
230. **diaphanum**; filaments setaceous, attenuated upwards, irregularly dichotomous, with short, lateral, dichotomous ramuli; internodes colourless, the lower long; nodes swollen, coloured; tetraspores whorled in the nodes; favellæ subterminal, involucre. (TAB. CXCI.)
231. **gracillimum**; excessively slender, very flaccid, dichotomous, with minute, flabelliform, dichotomous, lateral ramuli; internodes colourless, long; nodes opaque, purple; favellæ on the lateral ramuli, with a spreading involucre. (TAB. CCVI.)
232. **strictum**; capillary, dichotomous, all the divisions straight and erect, with narrow, acute axils; apices slightly incurved; internodes colourless; nodes (smooth or hairy) opaque, purple; favellæ near the ends of the branches, involucre; spores erumpent, whorled. (TAB. CCCXXXIV.)
233. **nodosum**; capillary, rigid, dichotomous, fastigiate; axils very patent; articulations pellucid, 4-6 times as long as broad; dissepiments swollen; tetraspores erumpent, on the outer edge of short ramuli; favellæ near the tips of short ramuli. (TAB. XC.)
234. **fastigiatum**; capillary, flaccid, dichotomous, level-topped, rosy; axils acute; internodes pellucid, 4-6 times longer than broad, the upper short and coloured; nodes coated with cells, not swollen; favellæ subterminal, involucre. (TAB. CCLV.)

\* \* \* *Nodes armed with spines or prickles.*

235. **flabelligerum**; setaceous, attenuated upwards, flabellately branched, irregularly dichotomous, with lateral, forked ramuli; the internodes clothed with coloured cellules; apices nearly straight; nodes contracted, each armed on the outer edge with a single, minute, subulate, coloured, 3-jointed prickle; tetraspores erumpent, whorled round the joint. (TAB. CXLIV.)
236. **echinotum**; dichotomous, fastigiate, with pellucid internodes; apices involute; nodes armed with numerous, slender, scattered, subulate, colourless, 1-jointed prickles; tetraspores solitary, erumpent, on the outer edge of the node; favellæ subtended by several, strongly incurved ramuli. (TAB. CXLI.)
237. **acanthotum**; dichotomous, fastigiate, with pellucid internodes; apices strongly involute; nodes armed on the outer edge with a single, robust, broadly subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the node; favellæ subtended by a short ramulus. (TAB. CXL.)
238. **ciliatum**; dichotomous, fastigiate, with pellucid internodes; apices strongly involute; nodes whorled with several robust, subulate, 3-jointed prickles; tetraspores alternating with the prickles; favellæ subtended by two or three ramuli. (TAB. CXXXIX.)

#### LXXXIII. SPYRIDIA.

239. **filamentosa**; irregularly branched, subopaque; branches set with setaceous ramuli. (TAB. XLVI.)



## LXXXIV. GRIFFITHSIA.

\* *Branches set with short ramelli.*

240. **equisetifolia**; stems robust; branches whorled throughout with closely imbricated, incurved, many times forked ramelli. (TAB. LXVII.)
241. **simplicifilum**; stems slender, irregularly branched, whorled with imbricated, straight, once-forked ramelli. (TAB. CCLXXXVII.)
242. **barbata**; dichotomous, slender; upper articulations emitting opposite or whorled, byssoid, dichotomous, short ramelli, to which the tetraspores are attached; favellæ stalked. (TAB. CCLXXXI.)

\* \* *Stems dichotomous, naked.*

243. **Devoniensis**; very slender, flaccid, dichotomous, the lower axils wide, the upper very acute; articulations cylindrical, 7–8 times as long as broad; involucre of tetraspores whorled round the dissepiments of the branches. (TAB. XVI.)
244. **corallina**; dichotomous, gelatinous; articulations pear-shaped, the ultimate ellipsoid; involucre sessile, those with tetraspores whorled round the branch, with favellæ lateral. (TAB. CCXIV.)
245. **secundiflora**; filaments ultra-setaceous, irregularly dichotomous; axils acute; branches fastigiate, obtuse, not tapering; articulations cylindrical, 2–4 times as long as broad, with a very wide border. (TAB. CLXXXV.)
246. **setacea**; filaments setaceous, straight, rigid, di-trichotomous; axils very acute; branches gradually attenuated to a point; articulations cylindrical, 5–6 times as long as broad; involucre, of both kinds, pedunculate, lateral. (TAB. CLXXXIV.)

## LXXXV. WRANGELIA.

247. **multifida**; stems setaceous, jointed, pinnate or bipinnate; ramuli opposite or whorled, pinnato-multifid. (TAB. XXVII.)

## LXXXVI. SEIROSPORA.

248. **Griffithsiana**. (TAB. XXI.)

## LXXXVII. CALLITHAMNION.

\* *Ramuli opposite.*

249. **Plumula**; stems dichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin. (TAB. CCXLII.)
250. **cruciatum**; densely tufted, subdichotomous, articulate; branches furnished at each joint with two or four, opposite or quaternate, short, pinnated ramuli; tetraspores elliptical, at the base of the ramuli. (TAB. CLXIV.)
251. **floccosum**; capillary, very flaccid, remotely branched; branches alternate, articulated, every joint bearing a pair of minute, opposite, spine-like ramuli; tetraspores elliptical, pedicellate. (TAB. LXXXI.)
252. **Turneri**; filaments rising from creeping fibres, simple or compound, once or twice pinnated with opposite, spreading ramuli; articulations of the main filaments 5–10 times as long as broad; tetraspores clustered, racemose or corymbose; favellæ involucred, stalked. (TAB. CLXXIX.)
253. **barbatum**; irregularly branched; branches alternate, subsimple, naked, or pinnulated with minute, opposite, spine-like ramuli; articulations twice as long as broad. (TAB. CLXV.)

254. **Pluma**; minute, rising from creeping filaments; stems erect, simple or branching; branches naked below, pinnated above; pinnæ erect, opposite, close; tetraspores globose, on short processes of the pinnules. (TAB. CCXCVI.)

\* \* *Stems shrubby, robust, more or less opaque. Ramuli alternate.*

255. **arbuscula**; stems shrubby, opaque, naked below, robust, much branched; branches densely set on all sides with minute imbricated plumules; ultimate pinnules simple or forked, recurved, their articulations twice as long as broad; tetraspores globose, lining the inner face of the pinnules. (TAB. CCLXXIV.)

256. **Brodiaei**; stem subopaque, veiny, obscurely jointed, slender; branches lateral, patent, closely set with quadrifarious secondary branches; plumules simply pinnate, the pinnæ sometimes ramulose at the tip; tetraspores oval, sessile near the tips of the pinnules; favellæ bilobed, on the secondary branches. (TAB. CXXIX.)

257. **tetragonum**; outline of the frond ovate; stem thick, setaceous, opaque, veiny, set with quadrifarious, lateral branches; penultimate branches articulate, set with short, alternate, level-topped plumules; pinnules incurved, constricted at the base, suddenly acuminate, their articulations once and half as long as broad; tetraspores very minute, oval, subterminal. (TAB. CXXXVI.)

258. **brachiatum**; character of *C. tetragonum*, except that the lowermost plumules are reduced to subulate ramuli; and the pinnules are not constricted at base, and taper *gradually* (not suddenly) at the apex. (TAB. CXXXVII.)

259. **tetricum**; rigid, shrubby; stem and branches robust, shaggy below, plumulate above; plumules crowded, simply pinnate; pinnæ acute, tapering at the base, erecto-patent; articulations twice or thrice as long as broad; tetraspores elliptical, minute, sessile on short lateral processes of the pinnæ. (TAB. CLXXXVIII.)

260. **Hookeri**; stem setaceous, nearly opaque, pinnatedly much branched; branches decompose, spreading, flexuous, densely plumulate; plumules naked below, pinnate or sub-bipinnate above, the pinnæ horizontal or divaricating, ramulose at the tips; articulations 2-3 times as long as broad; tetraspores numerous, sessile on the pinnules. (TAB. CCLXXIX.)

\* \* \* *Main stems slender, evidently jointed; branches decompose-pinnate. Ramuli alternate.*

261. **roseum**; much and loosely branched; secondary branches long, flexuous, distichously plumulate; plumules lax, simply pinnate; pinnæ long, spreading, curved; articulations 4-5 times as long as broad; tetraspores elliptical, secund, four or five on each pinna. (TAB. CCXXX.)

262. **byssoidium**; exceedingly slender, and flaccid, decompose; plumules long, flexuous, pinnate or sub-bipinnate; articulations of the branches eight, of the ramuli four times as long as broad; tetraspores one or two, sessile near the base of the pinnules. (TAB. CCLXII.)

263. **polyspermum**; tufts globose; filaments slender, much branched, secondary branches distichously plumulate; plumules long and narrow, simply pinnate; pinnæ short, simple, spine-like, patent; articulations 4-5 times as long as broad; tetraspores globose, lining the inner face of the pinnæ. (TAB. CCXXXI.)

264. **purpurascens**, Sm. E. Bot. t. 2465. (*Unknown to me.*)



265. **fasciculatum**; plumules long, erect, linear-obovate, truncate; pinnæ flexuous, the lower simple, appressed, the upper erecto-patent, ramulose near the tip; articulations of the branches veiny, thrice, of the ramuli once or twice as long as broad, with contracted dissepiments. (TAB. CCCVIII.)
266. **Borreri**; much branched, subdistichous, slender; branches set with plumules which are bare of ramuli in their lower half, and simply pinnate in their upper; pinnæ patent; articulations of the branches 2-5 times, of the pinnæ twice, as long as broad; tetraspores roundish, sessile on the inner face of the pinnules. (TAB. CLIX.)
267. **affine**; much branched and bushy; stem veiny; secondary branches long, densely plumulate; plumules very narrow, simply pinnate; pinnæ short, erect, the upper longest, crowded at the tips; articulations of the branches 3-4, of the pinnæ once and half as long as broad; tetraspores solitary, super-axillary. (TAB. CCCXXXI.)
268. **tripinnatum**; distichous, capillary, decompound-pinnate; plumules obovate, tripinnate above; the lower pinnæ short and abortive; each pinna having at its axil a minute pinnule; tetraspores oval, lateral on the axillary pinnules. (TAB. LXXVII.)
269. **gracillimum**; distichously branched, fan-shaped; stems capillary, decompound-pinnate; plumules bi-tri-pinnate; articulations of the stem 3-4, of the pinnæ 2-3 times as long as broad; tetraspores terminating the ultimate pinnules. (TAB. V.)
270. **thuyoideum**; capillary, distichously decompound, and repeatedly pinnate; plumules bi-tri-pinnate, lanceolate; articulations variable; tetraspores on the tips of the ultimate pinnules. (TAB. CCLXIX.)

\* \* \* \* \* *Stems articulate; branches and ramuli dichotomous.*

271. **corymbosum**; setaceous below, byssoid above, excessively branched; lesser branches repeatedly dichotomous, level-topped; ramuli many times forked; articulations of the branches 8-10 times as long as broad; tetraspores solitary and axillary, sessile. (TAB. CCLXXII.)
272. **spongiosum**; stems robust, opaque and veiny; branches quadrifarious, thickly clothed with dichotomous ramuli; axils patent; apices bifid; articulations of the branches swollen at the joints, twice or thrice as long as broad. (TAB. CXXV.)
273. **pedicellatum**; setaceous, pellucid, jointed throughout, irregularly divided; lesser branches dichotomous; apices very obtuse; articulations several times as long as broad; tetraspores stalked, pear-shaped, axillary. (TAB. CCXII.)

\* \* \* \* \* *Of small size and densely tufted, or minute parasites.*

274. **Rothii**; widely spreading, densely tufted; filaments very short, subdichotomous; branches very erect, straight, simple; articulations twice as long as broad; tetraspores oval, clustered, on short subterminal, corymbose ramuli. (TAB. CXX. B.)
275. **floridulum**; tufts very dense, globose, fastigiate; filaments slender, dichotomous; branches very erect, straight, simple; articulations thrice as long as broad; tetraspores oval, on short secund pedicels, along the branches. (TAB. CXX. A.)
276. **mesocarpum**; rising from creeping filaments; stems erect, subsimple; branches alternate, very erect, naked or nearly so; articulations 4-5 times as long as broad; tetraspores elliptical, on long, simple or forked, lateral pedicels. (TAB. CCCXXV.)

277. **sparsum**; parasitical, minute, scattered; filaments tufted, sparingly branched; branches simple, spreading, unequal; articulations 2–3 times as long as broad. (TAB. CCXCVII.)
278. **Daviesii**; rose-red, minute, tufted, much branched; branches curved; ramuli longish, crowded toward the axils of the secondary branches; tetraspores on the axillary ramuli, stalked. (TAB. CCCXIV.)
279. **virgatulum**; rose-red, minute, tufted, much branched; branches long and straight, alternate or secund; ramuli from every joint, short, obtuse, mostly secund; articulations thrice as long as broad; tetraspores scattered. (TAB. CCCXIII.)

### III. CHLOROSPERMEÆ.

#### Order 14. SIPHONACEÆ.

##### LXXXVIII. CODIUM.

280. **Bursa**; frond spherical, hollow. (TAB. CCXC.)
281. **adhærens**; frond forming a velvety crust on the surface to which it adheres. (TAB. XXXV. A.)
282. **amphibium**; fronds minute, erect, cylindrical, simple or nearly so, obtuse, aggregated in widely spreading strata. (TAB. XXXV. B.)
283. **tomentosum**; frond dichotomous. (TAB. XCIII.)

##### LXXXIX. BRYOPSIS.

284. **plumosa**; branches naked below, closely pinnated above the middle; pinnæ subdistichous. (TAB. III.)
285. **hypnoides**; slender, very much branched; ramuli capillary, ramellose towards the tips, irregularly inserted. (TAB. CXIX.)

##### XC. VAUCHERIA.

286. **submarina**; tufted, dichotomous, fastigate; sporangia numerous, lateral, sessile, ovate or lanceolate. (TAB. CCCL. B.)
287. **marina**; tufted; branches few, long, obtuse; sporangia solitary, obovate, pedicellate, lateral. (TAB. CCCL. A.)
288. **velutina**; filaments creeping; branches short, erect, fastigate, woven into a velvety stratum; sporangia globose, solitary, lateral, on short stalks. (TAB. CCCXXI.)

#### Order 15. CONFERVACEÆ.

##### XCI. CLADOPHORA.

289. **Brownii**; tufts cushion-like, dense, fastigate; filaments interwoven, flexuous, slightly branched; branches subsimple; articulations thickened upwards, 4–5 times as long as broad. (TAB. XXX.)
290. **repens**; tufts dense, globular; filaments rooting below, slightly branched; branches erect, sub-simple; ramuli few; articulations cylindrical, 10–20 times as long as broad. (TAB. CCXXXVI.)
291. **pellucida**; rigid, erect, setaceous, dark green, di-trichotomous; axils of



the branches very acute; dissepiments only at the forking of the branches and ramuli; articulations very long. (TAB. CLXXIV.)

292. **rectangularis**; filaments loosely tufted, setaceous, rigid; branches opposite, horizontal, distant, set with short, opposite, very patent ramuli; articulations 2-3 times as long as broad. (TAB. XII.)
293. **Macallana**; filaments setaceous, rigid, flexuous, loosely bundled, much branched; branches alternate, very patent; ramuli short, recurved, simple, obtuse; articulations twice or thrice as long as broad. (TAB. LXXXIV.)
294. **Hutchinsiae**; filaments setaceous, rigid, crisp, glaucous-green, flexuous, loosely tufted; ramuli erecto-patent, simple or pectinulate on the inner face; apices very obtuse; articulations 2-3 times as long as broad. (TAB. CXXIV.)
295. **diffusa**; filaments subsetaceous, loosely tufted, rigid, full green, flexuous, much branched; branches distant, irregularly subdivided, or subdichotomous, ramulose above; ramuli simple, secund; articulations 3-4 times as long as broad. (TAB. CXXX.)
296. **nuda**; rigid, slender, straight, dull green, sparingly dichotomous; branches few, scattered, appressed; articulations many times longer than broad. (TAB. CCCLI.)
297. **rupestris**; capillary, rigid, dark green, straight, bushy; branches erect, crowded, densely clothed with appressed, opposite or alternate ramuli; articulations 3-4 times as long as broad. (TAB. CLXXX.)
298. **laetevirens**; much branched, bushy, yellow-green; branches crowded, repeatedly divided, flexuous; ramuli secund, blunt, of few articulations; articulations of the branches six times, of the ramuli thrice, as long as broad. (TAB. CXC.)
299. **flexuosa**; capillary, tufted, flexuous, pale green, much branched; branches set with curved secondary or tertiary branches, which are pectinated with short, simple, secund, curved ramuli; articulations 3-4 times as long as broad. (TAB. CCCLIII.)
300. **gracilis**; filaments very long, capillary, flexuous, silky, much branched, yellow-green; main branches angularly bent; ramuli pectinate, secund, much attenuated, elongate; articulations 3-5 times longer than broad. (TAB. XVIII.)
301. **Balliana**; filaments very long, extremely slender and soft, grass-green, excessively branched; penultimate branches virgate and set with slender, secund, short ramuli; articulations of the branches eight to ten times, of the ramuli six to eight times, as long as broad. (TAB. CCCLVI.)
302. **Rudolphiana**; filaments very long and slender, flexuous, soft, much branched, yellow-green; branches irregular; ultimate ramuli very long, pectinate, patent; articulations many times longer than broad. (TAB. LXXXVI.)
303. **refracta**; filaments capillary, bright green, very much branched; secondary branches quadrifarious, repeatedly divided; branchlets closely set and widely spreading; ramuli pectinated; articulations twice or thrice as long as broad. (TAB. XXIV.)
304. **albida**; tufts dense, elongate, silky or spongy, soft; filaments exceedingly slender, decomposed; branches patent, the upper ones frequently opposite; ramuli opposite or secund; articulations 4-5 times as long as broad. (TAB. CCLXXV.)
305. **lanosa**; filaments slender, short, yellow-green, forming dense, globular

- tufts; branches virgate, erect, subdistant, straight, alternate; ramuli few, scattered; axils very acute; lower articulations twice, upper six times as long as broad. (TAB. VI.)
306. **uncialis**; tufts short, spongy, divided; filaments flexuous, sparingly branched, interwoven and rooting; ramuli secund, distant; articulations twice as long as broad. (TAB. CCVII.)
307. **arcta**; tufts very dense, starry, bright green; filaments matted at the base, much branched; branches straight, crowded, very erect; ramuli appressed; articulations in the older parts once or twice as long as broad, in the younger many times longer. (TAB. CXXXV.)
308. **glaucescens**; tufts dense, glaucous green; filaments very slender, zigzag, much branched; branches erect, lesser ones pectinate, with very erect, close-set, straight, elongated ramuli; articulations thrice as long as broad. (TAB. CXCVI.)
309. **falcata**; densely tufted, dark green; filaments rigid, curved, irregularly divided; branches zigzag, decompound, the lesser branches arched, or incurved and falcate, ramulose on their inner faces; ramuli blunt; articulations 3–4 times as long as broad, with a dense endochrome and pellucid dissepiments. (TAB. CCXVI.)
310. **Magdalenæ**; filaments capillary, blackish-green, short, decumbent, matted together, slightly branched, angularly bent; branches divaricate, dichotomous; ramuli few, falcate; articulations three to four times as long as broad. (TAB. CCCLV. *A*.)
311. **Gattyæ**; filaments short, dingy green, capillary, matted together, densely tufted, dichotomous, flexuous, with few ramuli; articulations once and half as long as broad. (TAB. CCCLV. *B*.)
312. **flavescens**; forming pale yellowish strata; filaments slender, sparingly divided, subdichotomous, flexuous; ramuli long, alternate or secund; articulations 8–9 times as long as broad. (TAB. CCXCVIII.)
313. **fracta**; tufts entangled, often floating, dull green; filaments rigid, distantly branched, subdichotomous, with wide axils; ramuli few, alternate or secund; articulations 3–6 times as long as broad, at length elliptical. (TAB. CCXCIV.)

## XCII. RHIZOCLONIUM.

314. **riparium**; slender, pale green, flaccid, angularly bent; articulations about twice as long as broad. (TAB. CCXXXVIII.)
315. **Casparyi**; filaments extremely slender, pale, interwoven, curved and bent; angles emitting root-like branches; articulations 2–6 times longer than broad; endochrome granular. (TAB. CCCLIV. *B*.)

## XCIII. CONFERVA.

\* *Decumbent, stratified.*

316. **arenicola**; threads soft, extremely fine, matted, very pale green; articulations once and half as long as broad. (TAB. CCCLIV. *A*.)
317. **arenosa**; filaments slender, straightish, rigid, forming wide strata; joints 3–5 times as long as broad. (TAB. LIV. *C*.)
318. **litorea**; filaments thick, rigid, crisped, loosely bundled, dull green; articulations once and half as long as broad, here and there swollen in pairs and discoloured. (TAB. CCCXXXIII.)



319. **Linum**; filaments very thick, of great length, curled, rigid, loosely bundled; articulations as long as broad. (TAB. CL. A.)
320. **sutoria**; filaments setaceous, long, flexuous, dark green; articulations once and half as long as broad. (TAB. CL. B.)
321. **tortuosa**; filaments rigid, slender, curled, interwoven in spreading strata; joints twice or thrice as long as broad. (TAB. LIV. A.)
322. **implexa**; filaments very slender, rather flaccid, forming entangled, bright-green strata; joints as long as, or longer than broad. (TAB. LIV. B.)

\* \* *Fixed by the base, tufted.*

323. **Melagonium**; filaments erect, straight, robust, slightly tufted, stiff and wiry, dark green; joints twice as long as broad. (TAB. XCIX. A.)
324. **ærea**; filaments fixed, long, setaceous, tufted, straight, harsh, brittle, yellow-green; joints as long as broad. (TAB. XCIX. B.)
325. **collabens**; filaments long, straight, tufted, variable in diameter, gelatinous and flaccid, æruginous green; articulations as long as broad, with dense, granular endochrome. (TAB. CCCXXVII.)
326. **bangioides**; filaments long, slender, soft, lubricous, wavy; articulations twice as long as broad, containing at maturity a dense green mass; dissepiments broad and pellucid. (TAB. CCLXVIII.)
327. **Youngana**; filaments short, tufted, nearly straight; articulations once or twice as long as broad; dissepiments contracted. (TAB. CCCXXVIII.)
328. **clandestina**, Berk. Gl. Br. Alg. t. 13. f. 1. (*Unknown to me.*)

#### XCIV. OCHLOCHÆTE.

329. **Hystrix**. (TAB. CCXXVI.)

#### Order 16. ULVACEÆ.

#### XCV. ENTEROMORPHA.

330. **cornucopiæ**; gregarious, small; fronds stipitate, suddenly dilated, at length torn, plaited at the margin. (TAB. CCCIV.)
331. **intestinalis**; simple, clavate, at length inflated, tapering much to the base. (TAB. CLIV.)
332. **compressa**; branching, compressed, more or less compounded; branches subsimple, obtuse, much attenuated at the base. (TAB. CCCXXXV.)
333. **Linkiana**; cylindrical, reticulated, very pale, membranaceous (rigid when dry), much branched; branches alternate, spreading. (TAB. CCCXLIV.)
334. **erecta**; frond cylindrical, filiform, slender; branches erect, opposite or alternate, all attenuated to a point; ramuli capillary, erecto-patent; cells rectangular, filled with endochrome. (TAB. XLIIL.)
335. **clathrata**; cylindrical, filiform, slender, reticulated, much branched; branches decompound, spreading, set with divaricated, spine-like ramuli. (TAB. CCCXL.)
336. **ramulosa**; frond subcompressed, irregularly branched; main divisions long and subsimple; lateral branches curved and twisted, everywhere clothed with short, divaricated, spine-like ramuli. (TAB. CCXLV.)
337. **Hopkirkii**; frond byssoid, excessively branched; branches erect, attenuate, bearing scattered, subulate ramuli; reticulations very large, each areole containing one or two minute grains. (TAB. CCLXIII.)

338. **percursa**; capillary, entangled, simple, compressed, subsolid, reticulated; cells quadrate, two or more in the breadth of the frond; endochrome filling the cell. (TAB. CCCLII.)

339. **Ralfsii**; capillary, simple or nearly so, subsolid, largely reticulated; areoles large, hyaline, 2–4 in the breadth of the frond, each containing a bright-green grain of endochrome. (TAB. CCLXXXII.)

#### XCVI. ULVA.

340. **latissima**; frond broadly ovate or oblong, membranous, full-green. (TAB. CLXXI.)

341. **Lactuca**; frond very delicate, at first saccate; then cleft to the base into numerous lacinated flat segments. (TAB. CCXLIII.)

342. **Linza**; frond linear-lanceolate, undulate. (TAB. XXXIX.)

#### XCVII. PORPHYRA.

343. **laciniata**; frond deeply and irregularly cleft. (TAB. XCII.)

344. **vulgaris**; frond simple, lanceolate, wavy. (TAB. CCXI.)

344.\* *P. miniata*, Ag.—Carm. Hook. Br. Fl. v. ii. p. 310. (*Unknown to me.*)

#### XCVIII. BANGIA.

345. **fuscopurpurea**; stratum brownish-purple; filaments long, simple, decumbent, here and there constricted; granules several in each transverse band. (TAB. XCVI.)

346. **ciliaris**; filaments very minute, erect, simple, straight, compressed, purple; grains two or three in each transverse band, globose, sometimes solitary. (TAB. CCCXXII.)

347. **ceramicola**; filaments parasitical, very slender, elongate, rosy; articulations once or twice as long as broad, longitudinally striate; the endochrome at length globular. (TAB. CCCXVII.)

348. **carnea**, Dillw. t. 84. (*Unknown to me.*)

349. (?) **elegans**; filaments minute, dichotomous, with wide axils; granules binate, in a single row. (TAB. CCXLVI.)

### Order 17. OSCILLATORIACEÆ.

#### XCIX. RIVULARIA.

350. **plicata**; fronds gregarious, gelatinous, plaited, often hollow and at length ruptured, dull dark green; filaments wavy, associated in dichotomous series. (TAB. CCCXV.)

351. **atra**; globose, minute, very firm and smooth, glossy, black-green; filaments densely packed. (TAB. CCXXXIX.)

352. **applanata**, Carm. in Hook. Br. Fl. vol. ii. p. 392. (*Unknown to me.*)

353. **nitida**; frond subgelatinous, lobed and plaited, hollow, lubricous, dark shining green. (TAB. LXVIII.)

#### C. SCHIZOSIPHON.

354. **Warreniæ**. (TAB. CCCXVI.)

#### CI. SCHIZOTHRIX.

355. **Cresswellii**; tufts pulvinate; filaments very slender, fastigiate, collected into branching bundles. (TAB. CLX.)



## CII. CALOTHRIX.

356. **confervicola**; filaments short, tufted, glaucous green, opaque, blunt, rigid, nearly straight. (TAB. CCLIV.)
357. **mucor**, Ag.—Br. Fl. vol. ii. p. 367. (*Unknown to me.*)
358. **luteola**; filaments exceedingly minute, slender, scattered, filiform, obtuse, hyaline or containing light green endochrome. (TAB. CCCXLII.)
359. **scopulorum**; stratum velvety, dirty green; filaments flexuous, subulate, subattenuate, simple. (TAB. LVIII. B.)
360. **fasciculata**; stratum widely spreading, velvety, dark green; filaments straight, subulate, attenuated, fasciculately pseudo-branched. (TAB. LVIII. A.)
361. **pannosa**; filaments long, much curled, and densely interwoven into lamellated tufts or honey-combed strata; endochrome filling the tube, dark green, densely annulated. (TAB. LXXVI.)
362. **semiplena**; filaments long, slender, tough, flexuous, densely interwoven in lamellated tufts; endochrome glaucous, frequently interrupted, leaving parts of the tube empty. (TAB. CCCIX.)
363. **hydroides**; patches widely spreading, dark green; filaments flexuous, decumbent, their tips cohering in rigid, erect, tooth-like fascicles; border rather wide. (TAB. CCCVI.)
364. **cæspitula**; tufts convex, soft, cushioned, blackish-green; filaments densely packed, flexuous, obtuse, not attenuated; border narrow. (TAB. CCCV.)

## CIII. LYNGBYA.

\* *Tube continuous; endochrome cylindrical, imperfectly annulated.*

365. **majuscula**; strata of large dimensions, blackish-green; filaments thick, bundled, twisted, obtuse; endochrome densely annulated. (TAB. LXII.)
366. **ferruginea**; filaments slender, flaccid, forming a stratum of a verdigris-green colour, which at length changes to pale chestnut. (TAB. CCCXI.)
- \* \* *Tube imperfectly articulated; endochrome distinctly annulated, with pellucid interspaces.*
367. **Carmichaelii**; filaments very long, thickish, curled, grass-green; tube imperfectly jointed. (TAB. CLXXXVI. A.)
368. **speciosa**; filaments very long, thick, flaccid, straight, at length curled, the margin slightly crenate, yellow-green, glossy when dry; tube imperfectly jointed. (TAB. CLXXXVI. B.)
369. **flacca**; filaments short, tufted, nearly straight, occasionally proliferous, articulated; articulations shorter than their breadth; endochrome at length much contracted. (TAB. CCC.)
370. **Cutleriae**; exceedingly slender, soft, articulated; articulations as long as broad, the endochrome at length spherical. (TAB. CCCXXXVI.)

## CIV. MICROCOLEUS.

371. **anguiformis**; sheaths snake-like, simple, decumbent, tapering to one extremity; striæ distant. (TAB. CCXLIX.)

## CV. OSCILLATORIA.

372. **littoralis**; stratum vivid green; filaments thick, dark green, curved; striæ conspicuous, closely set. (TAB. CV. A.)
373. **subsalsa**, Ag.—Br. Fl. vol. ii. p. 376. (*Unknown to me.*)

374. **spiralis**; stratum membranaceous, dark green, not very lubricous; filaments slender, spirally twisted, densely interwoven. (TAB. CV. *B.*)
375. **nigroviridis**; stratum very dark; filaments pale green, with obtuse, curved apices; striæ distant, half the diameter of the filament. (TAB. CCLI. *A.*)
376. **subuliformis**; stratum æruginous-green; filaments bright green, subuliform; striæ distant  $\frac{1}{2}$ – $\frac{3}{4}$  the diameter of the filament. (TAB. CCLI. *B.*)
377. **insignis**; stratum blackish-brown; filaments brown, very thick, their apices obtuse, slightly oblique and ciliated; striæ very close. (TAB. CCLI. *C.*)

## CVI. SPIRULINA.

378. **tenuissima**; stratum very lubricous, æruginous; filaments densely spiral, very slender, flexuous. (TAB. CV. *C.*)
379. **Hutchinsiae**, Kütz. (*Unknown to me.*)

## Order 18. NOSTOCHACEÆ.

## CVII. MONORMIA.

380. **intricata**. (TAB. CCLVI.)

## CVIII. SPHÆEROZYGA.

381. **Carmichaelii**; spores oblong, twice or thrice as long as broad, next the connecting cell. (TAB. CXIII. *A.*)
382. **Thwaitesii**; spores elliptical, once and a half as long as broad, distant from the ciliated connecting cell. (TAB. CXIII. *B.*)
383. **Broomei**; spores numerous, elliptical, twice as long as wide, commencing nearest the connecting cells, which are smooth and subquadrate. (TAB. CLXXIII. *A.*)
384. **Berkeleyana**; spores large, twice the width of ordinary cells, oblong, half as long again as wide, brown when mature, two on each side the connecting cell, which is spheroidal. (TAB. CLXXIII. *B.*)
385. **Ralfsii**, Thw.—Harv. Man. ed. 2. p. 233. (*Not figured.*)

## CIX. SPERMOSIRA.

386. **litorea**; filaments nearly straight; cells very short, compressed, closely packed; spores elliptical, not wider than the cells. (TAB. CXIII. *C.*)
387. **Harveyana**; filaments much curved, composed of cells nearly as long as broad; spores exactly spherical, almost twice the diameter of the cells; connecting cells subquadrate, rather longer than wide, and of the same width as the ordinary cells. (TAB. CLXXIII. *C.*)

## Order 19. PALMELLACEÆ.

## CX. HORMOSPORA.

388. **ramosa**; branched; endochrome radiated. (TAB. CCXIII.)





# GENERAL INDEX

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## SYNOPSIS AND PLATES.

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| barbatum . .                   | 253  | 165    | Calothrix caespitula . . . . . | 364 | 305    |
| Borreri . . . .                | 266  | 159    | confervicola . . . .           | 356 | 254    |
| brachiatum                     | 258  | 137    | fasciculata . . . . .          | 360 | 58     |
| Brodiaei . . .                 | 256  | 129    | hydroides . . . . .            | 363 | 306    |
| byssoides . .                  | 262  | 262    | luteola . . . . .              | 358 | 342    |
| corymbosum                     | 271  | 272    | mucor . . . . .                | 357 |        |
| cruciatum . .                  | 250  | 164    | pannosa . . . . .              | 361 | 76     |
| Daviesii . . .                 | 278  | 314    | scopulorum . . . .             | 359 | 58     |
| fasciculatum                   | 265  | 308    | semiplena . . . . .            | 362 | 309    |
| floccosum . .                  | 251  | 81     | Carpomitra Cabrerae . . . .    | 22  | 14     |
| floridulum .                   | 275  | 120    | Catenella Opuntia . . . . .    | 214 | 88     |
| gracillimum                    | 269  | 5      | Ceramium acanthonotum .        | 237 | 140    |
| Hookeri . . .                  | 260  | 279    | botryocarpum . .               | 227 | 215    |



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|-----------------------------------------|------|--------|------------------------------------------|------|--------|
| <i>Ceramium ciliatum</i> . . . . .      | 238  | 139    | <i>Cladophora repens</i> . . . . .       | 290  | 236    |
| <i>decurrens</i> . . . . .              | 228  | 276    | <i>Rudolphiana</i> . . . . .             | 302  | 86     |
| <i>Deslongchampii</i> . . . . .         | 229  | 219    | <i>rupestris</i> . . . . .               | 297  | 180    |
| <i>diaphanum</i> . . . . .              | 230  | 193    | <i>uncialis</i> . . . . .                | 306  | 207    |
| <i>echionotum</i> . . . . .             | 236  | 141    | <i>Cladostephus spongiosus</i> . . . . . | 71   | 138    |
| <i>fastigiatum</i> . . . . .            | 234  | 255    | <i>verticillatus</i> . . . . .           | 70   | 33     |
| <i>flabelligerum</i> . . . . .          | 235  | 144    | <i>Codium adhærens</i> . . . . .         | 281  | 35     |
| <i>gracillimum</i> . . . . .            | 231  | 206    | <i>amphibium</i> . . . . .               | 282  | 35     |
| <i>nodosum</i> . . . . .                | 233  | 90     | <i>Bursa</i> . . . . .                   | 280  | 290    |
| <i>rubrum</i> . . . . .                 | 226  | 181    | <i>tomentosum</i> . . . . .              | 283  | 93     |
| <i>strictum</i> . . . . .               | 232  | 334    | <i>Conferva ærea</i> . . . . .           | 324  | 99     |
| <i>Chondrus crispus</i> . . . . .       | 197  | 63     | <i>arenicola</i> . . . . .               | 316  | 354    |
| <i>Norvegicus</i> . . . . .             | 198  | 187    | <i>arenosa</i> . . . . .                 | 317  | 54     |
| <i>Chorda filum</i> . . . . .           | 30   | 107    | <i>bangioides</i> . . . . .              | 326  | 268    |
| <i>lomentaria</i> . . . . .             | 31   | 285    | <i>clandestina</i> . . . . .             | 328  |        |
| <i>Chordaria divaricata</i> . . . . .   | 52   | 17     | <i>collabens</i> . . . . .               | 325  | 327    |
| <i>flagelliformis</i> . . . . .         | 51   | 111    | <i>implexa</i> . . . . .                 | 322  | 54     |
| <i>Chrysomenia clavellosa</i> . . . . . | 140  | 114    | <i>Linum</i> . . . . .                   | 319  | 150    |
| <i>rosea</i> . . . . .                  | 141  | 301    | <i>litorea</i> . . . . .                 | 318  | 333    |
| <i>Chylocladia articulata</i> . . . . . | 146  | 283    | <i>Melagonium</i> . . . . .              | 323  | 99     |
| <i>kaliformis</i> . . . . .             | 143  | 145    | <i>sutoria</i> . . . . .                 | 320  | 150    |
| <i>ovalis</i> . . . . .                 | 142  | 118    | <i>tortuosa</i> . . . . .                | 321  | 54     |
| <i>parvula</i> . . . . .                | 145  | 210    | <i>Youngana</i> . . . . .                | 327  | 328    |
| <i>reflexa</i> . . . . .                | 144  | 42     | <i>Corallina elongata</i> . . . . .      | 148  |        |
| <i>Cladophora albida</i> . . . . .      | 304  | 275    | <i>officinalis</i> . . . . .             | 147  | 222    |
| <i>arcta</i> . . . . .                  | 307  | 135    | <i>squamata</i> . . . . .                | 149  | 201    |
| <i>Balliana</i> . . . . .               | 301  | 356    | <i>Crouania attenuata</i> . . . . .      | 222  | 106    |
| <i>Brownii</i> . . . . .                | 289  | 30     | <i>Cruoria pellita</i> . . . . .         | 215  | 117    |
| <i>diffusa</i> . . . . .                | 295  | 130    | <i>Cutleria multifida</i> . . . . .      | 32   | 75     |
| <i>falcata</i> . . . . .                | 309  | 216    | <i>Cystoseira barbata</i> . . . . .      | 6    | 360    |
| <i>flavescens</i> . . . . .             | 312  | 298    | <i>ericoides</i> . . . . .               | 4    | 265    |
| <i>flexuosa</i> . . . . .               | 299  | 353    | <i>fibrosa</i> . . . . .                 | 8    | 133    |
| <i>fracta</i> . . . . .                 | 313  | 294    | <i>foeniculacea</i> . . . . .            | 7    | 122    |
| <i>Gattyæ</i> . . . . .                 | 311  | 355    | <i>granulata</i> . . . . .               | 5    | 60     |
| <i>glaucescens</i> . . . . .            | 308  | 196    | <i>Dasya arbuscula</i> . . . . .         | 132  | 224    |
| <i>gracilis</i> . . . . .               | 300  | 18     | <i>coccinea</i> . . . . .                | 130  | 253    |
| <i>Hutchinsiae</i> . . . . .            | 294  | 124    | <i>ocellata</i> . . . . .                | 131  | 40     |
| <i>lætevirens</i> . . . . .             | 298  | 190    | <i>venusta</i> . . . . .                 | 133  | 225    |
| <i>lanosa</i> . . . . .                 | 305  | 6      | <i>Delesseria alata</i> . . . . .        | 165  | 247    |
| <i>Macallana</i> . . . . .              | 293  | 84     | <i>angustissima</i> . . . . .            | 166  | 83     |
| <i>Magdalenæ</i> . . . . .              | 310  | 355    | <i>Hypoglossum</i> . . . . .             | 167  | 2      |
| <i>nuda</i> . . . . .                   | 296  | 351    | <i>ruscifolia</i> . . . . .              | 168  | 26     |
| <i>pellucida</i> . . . . .              | 291  | 174    | <i>sanguinea</i> . . . . .               | 163  | 151    |
| <i>rectangularis</i> . . . . .          | 292  | 12     | <i>sinuosa</i> . . . . .                 | 164  | 259    |
| <i>refracta</i> . . . . .               | 303  | 24     | <i>Desmarestia aculeata</i> . . . . .    | 18   | 49     |

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|--------------------------------------------|------|--------|-------------------------------------------|------|--------|
| <i>Desmarestia ligulata</i> . . . . .      | 17   | 115    | <i>Fucus serratus</i> . . . . .           | 12   | 47     |
| <i>viridis</i> . . . . .                   | 19   | 312    | <i>vesiculosus</i> . . . . .              | 10   | 204    |
| <i>Dictyosiphon fœniculaceus</i> . . . . . | 41   | 326    | <i>Furcellaria fastigiata</i> . . . . .   | 207  | 94     |
| <i>Dictyota atomaria</i> . . . . .         | 37   | 1      | <i>Gelidium cartilagineum</i> . . . . .   | 192  | 337    |
| <i>dichotoma</i> . . . . .                 | 38   | 103    | <i>corneum</i> . . . . .                  | 191  | 53     |
| <i>Dudresnaia coccinea</i> . . . . .       | 220  | 244    | <i>Gigartina acicularis</i> . . . . .     | 194  | 104    |
| <i>divaricata</i> . . . . .                | 221  | 110    | <i>mamillosa</i> . . . . .                | 196  | 199    |
| <i>Dumontia filiformis</i> . . . . .       | 208  | 59     | <i>pistillata</i> . . . . .               | 193  | 232    |
| <i>Ectocarpus amphibius</i> . . . . .      | 81   | 183    | <i>Teedii</i> . . . . .                   | 195  | 266    |
| <i>brachiatus</i> . . . . .                | 94   | 4      | <i>Ginannia furcellata</i> . . . . .      | 210  | 69     |
| <i>crinitus</i> . . . . .                  | 86   | 330    | <i>Gloiosiphonia capillaris</i> . . . . . | 217  | 57     |
| <i>distortus</i> . . . . .                 | 88   | 329    | <i>Gracilaria compressa</i> . . . . .     | 186  | 205    |
| <i>fasciculatus</i> . . . . .              | 83   | 273    | <i>confervoides</i> . . . . .             | 187  | 65     |
| <i>fenestratus</i> . . . . .               | 82   | 257    | <i>erecta</i> . . . . .                   | 188  | 177    |
| <i>granulosus</i> . . . . .                | 92   | 200    | <i>multipartita</i> . . . . .             | 185  | 15     |
| <i>Hincksia</i> . . . . .                  | 84   | 22     | <i>Grateloupia filicina</i> . . . . .     | 190  | 100    |
| <i>Landsburgii</i> . . . . .               | 89   | 233    | <i>Griffithsia barbata</i> . . . . .      | 242  | 281    |
| <i>littoralis</i> . . . . .                | 90   | 197    | <i>corallina</i> . . . . .                | 244  | 214    |
| <i>longifructus</i> . . . . .              | 91   | 258    | <i>Devoniensis</i> . . . . .              | 243  | 16     |
| <i>Mertensii</i> . . . . .                 | 95   | 132    | <i>equisetifolia</i> . . . . .            | 240  | 67     |
| <i>pusillus</i> . . . . .                  | 87   | 153    | <i>secundiflora</i> . . . . .             | 245  | 185    |
| <i>siliculosus</i> . . . . .               | 80   | 162    | <i>setacea</i> . . . . .                  | 246  | 184    |
| <i>sphærophorus</i> . . . . .              | 93   | 126    | <i>simplicifilum</i> . . . . .            | 241  | 287    |
| <i>tomentosus</i> . . . . .                | 85   | 182    | <i>Gymnogongrus Griffithsia</i> . . . . . | 204  | 108    |
| <i>Elachista curta</i> . . . . .           | 61   | 332    | <i>plicatus</i> . . . . .                 | 205  | 288    |
| <i>flaccida</i> . . . . .                  | 60   | 260    | <i>Halidrys siliquosa</i> . . . . .       | 3    | 66     |
| <i>fucicola</i> . . . . .                  | 59   | 240    | <i>Haliseris polypodioides</i> . . . . .  | 33   | 19     |
| <i>pulvinata</i> . . . . .                 | 64   | 28     | <i>Halymenia ligulata</i> . . . . .       | 209  | 112    |
| <i>scutulata</i> . . . . .                 | 63   | 323    | <i>Hapalidium Phyllactidium</i> . . . . . | 162  | 166    |
| <i>stellulata</i> . . . . .                | 62   | 261    | <i>Hildenbrandtia rubra</i> . . . . .     | 161  | 250    |
| <i>velutina</i> . . . . .                  | 65   | 28     | <i>Himanthalia lorea</i> . . . . .        | 16   | 78     |
| <i>Enteromorpha clathrata</i> . . . . .    | 335  | 340    | <i>Hormospora ramosa</i> . . . . .        | 388  | 213    |
| <i>compressa</i> . . . . .                 | 332  | 335    | <i>Hypnea purpurascens</i> . . . . .      | 189  | 116    |
| <i>cornucopiæ</i> . . . . .                | 330  | 304    | <i>Iridæa edulis</i> . . . . .            | 213  | 97     |
| <i>erecta</i> . . . . .                    | 334  | 43     | <i>Jania corniculata</i> . . . . .        | 151  | 234    |
| <i>intestinalis</i> . . . . .              | 331  | 154    | <i>rubens</i> . . . . .                   | 150  | 252    |
| <i>Hopkirkii</i> . . . . .                 | 337  | 263    | <i>Kallymenia Dubyi</i> . . . . .         | 212  | 123    |
| <i>Linkiana</i> . . . . .                  | 333  | 344    | <i>reniformis</i> . . . . .               | 211  | 13     |
| <i>percursa</i> . . . . .                  | 338  | 352    | <i>Laminaria bulbosa</i> . . . . .        | 25   | 241    |
| <i>Ralfsii</i> . . . . .                   | 339  | 282    | <i>digitata</i> . . . . .                 | 24   | 223    |
| <i>ramulosa</i> . . . . .                  | 336  | 245    | <i>Fascia</i> . . . . .                   | 29   | 45     |
| <i>Fucus canaliculatus</i> . . . . .       | 15   | 229    | <i>longicruris</i> . . . . .              | 26   | 339    |
| <i>ceranoides</i> . . . . .                | 11   | 271    | <i>Phyllitis</i> . . . . .                | 28   | 192    |
| <i>Mackaii</i> . . . . .                   | 14   | 52     | <i>saccharina</i> . . . . .               | 27   | 289    |
| <i>nodosus</i> . . . . .                   | 13   | 158    | <i>Laurencia cæspitosa</i> . . . . .      | 136  | 286    |



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| <i>Laurencia dasyphylla</i> . . . . | 138  | 152    | <i>Ochlochæte Hystrix</i> . . . .     | 329  | 226    |
| <i>obtusa</i> . . . . .             | 137  | 148    | <i>Odonthalia dentata</i> . . . . .   | 98   | 34     |
| <i>pinnatifida</i> . . . .          | 135  | 55     | <i>Oscillatoria insignis</i> . . . .  | 377  | 251    |
| <i>tenuissima</i> . . . .           | 139  | 198    | <i>littoralis</i> . . . .             | 372  | 105    |
| <i>Leathesia Berkeleyi</i> . . . .  | 57   | 176    | <i>nigroviridis</i> . .               | 375  | 251    |
| <i>tuberiformis</i> . . .           | 56   | 324    | <i>spiralis</i> . . . . .             | 374  | 105    |
| <i>Lithocystis Allmanni</i> . . . . | 162  | 166    | <i>subsalsa</i> . . . .               | 373  |        |
| <i>Litosiphon Laminariæ</i> . . .   | 50   | 295    | <i>subuliformis</i> . .               | 376  | 251    |
| <i>pusillus</i> . . . . .           | 49   | 270    | <i>Padina Pavonia</i> . . . . .       | 34   | 91     |
| <i>Lyngbya Carmichaelii</i> . . .   | 367  | 186    | <i>Peyssonelia Dubyi</i> . . . . .    | 203  | 71     |
| <i>Cutleriæ</i> . . . . .           | 370  | 336    | <i>Phyllophora Brodiaei</i> . . . .   | 201  | 20     |
| <i>ferruginea</i> . . . .           | 366  | 311    | <i>membranifolia</i>                  | 200  | 163    |
| <i>flacca</i> . . . . .             | 369  | 300    | <i>palmettoides</i> .                 | 202  | 310    |
| <i>majuscula</i> . . . .            | 365  | 62     | <i>rubens</i> . . . . .               | 199  | 131    |
| <i>speciosa</i> . . . . .           | 368  | 186    | <i>Plocamium coccineum</i> . . .      | 175  | 44     |
| <i>Melobesia agariciformis</i> . .  | 155  | 73     | <i>Polyides rotundus</i> . . . . .    | 206  | 95     |
| <i>calcareæ</i> . . . . .           | 153  | 291    | <i>Polysiphonia affinis</i> . . . . . | 123  | 303    |
| <i>farinosa</i> . . . . .           | 158  | 347    | <i>atrorubescens</i>                  | 125  | 172    |
| <i>fasciculata</i> . . . .          | 154  | 74     | <i>Brodiaei</i> . . . .               | 118  | 195    |
| <i>lichenoides</i> . . . .          | 156  | 346    | <i>byssoides</i> . . .                | 129  | 284    |
| <i>membranacea</i> . .              | 157  | 347    | <i>Carmichaeliana</i>                 | 116  | 319    |
| <i>polymorpha</i> . . .             | 152  | 345    | <i>elongata</i> . . . .               | 114  | 292    |
| <i>pustulata</i> . . . .            | 160  | 347    | <i>elongella</i> . . .                | 113  | 146    |
| <i>verrucata</i> . . . .            | 159  | 347    | <i>fastigiata</i> . . .               | 127  | 299    |
| <i>Mesogloia Griffithsiana</i> . .  | 54   | 318    | <i>fibrata</i> . . . . .              | 109  | 208    |
| <i>vermicularis</i> . . .           | 53   | 31     | <i>fibrillosa</i> . . .               | 117  | 302    |
| <i>virescens</i> . . . . .          | 55   | 82     | <i>formosa</i> . . . .                | 107  | 168    |
| <i>Microcladia glandulosa</i> . .   | 225  | 29     | <i>furcellata</i> . . .               | 126  | 7      |
| <i>Microcoleus anguiformis</i> . .  | 371  | 249    | <i>Grevillii</i> . . . .              | 115  |        |
| <i>Monormia intricata</i> . . . . . | 380  | 256    | <i>Griffithsiana</i> .                | 112  | 228    |
| <i>Myrionema clavatum</i> . . . .   | 69   | 348    | <i>nigrescens</i> . .                 | 122  | 277    |
| <i>Leclancherii</i> . .             | 67   | 41     | <i>obscura</i> . . . .                | 120  | 102    |
| <i>punctiforme</i> . .              | 68   | 41     | <i>parasitica</i> . . .               | 128  | 147    |
| <i>strangulans</i> . .              | 66   | 280    | <i>pulvinata</i> . . .                | 108  | 102    |
| <i>Myriotrichia clavæformis</i> .   | 96   | 101    | <i>Richardsoni</i> .                  | 111  | 10     |
| <i>filiformis</i> . . .             | 97   | 156    | <i>simulans</i> . . .                 | 121  | 278    |
| <i>Naccaria Wigghii</i> . . . . .   | 216  | 38     | <i>spinulosa</i> . . .                | 110  | 320    |
| <i>Nemalion multifidum</i> . . .    | 218  | 36     | <i>stricta</i> . . . . .              | 107  |        |
| <i>purpureum</i> . . .              | 219  | 161    | <i>subulifera</i> . .                 | 124  | 227    |
| <i>Nitophyllum Bonnemaisoni</i>     | 171  | 23     | <i>urceolata</i> . . .                | 106  | 167    |
| <i>Gmelini</i> . . . .              | 172  | 235    | <i>variegata</i> . . .                | 119  | 155    |
| <i>Hilliae</i> . . . . .            | 170  | 169    | <i>violacea</i> . . . .               | 115  | 209    |
| <i>laceratum</i> . .                | 173  | 267    | <i>Porphyra laciniata</i> . . . . .   | 343  | 92     |
| <i>punctatum</i> . .                | 169  | 202    | <i>miniata</i> . . . . .              | 344* |        |
| <i>versicolor</i> . . .             | 174  | 9      | <i>vulgaris</i> . . . . .             | 344  | 211    |

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| <i>Ptilota plumosa</i> . . . . .          | 223  | 80     | <i>Sphacelaria cirrhosa</i> . . . . .        | 76   | 178    |
| <i>sericea</i> . . . . .                  | 224  | 191    | <i>filicina</i> . . . . .                    | 72   | 142    |
| <i>Punctaria latifolia</i> . . . . .      | 43   | 8      | <i>fusca</i> . . . . .                       | 77   | 149    |
| <i>plantaginea</i> . . . . .              | 44   | 128    | <i>plumosa</i> . . . . .                     | 75   | 87     |
| <i>tenuissima</i> . . . . .               | 45   | 248    | <i>racemosa</i> . . . . .                    | 79   | 349    |
| <i>Pycnophycus tuberculatus</i> . . . . . | 9    | 89     | <i>radicans</i> . . . . .                    | 78   | 189    |
| <i>Ralfsia verrucosa</i> . . . . .        | 58   | 98     | <i>scoparia</i> . . . . .                    | 74   | 37     |
| <i>Rhizoclonium Casparyi</i> . . . . .    | 315  | 354    | <i>Sertularia</i> . . . . .                  | 73   | 143    |
| <i>riparium</i> . . . . .                 | 314  | 238    | <i>Sphærococcus coronopifolius</i> . . . . . | 184  | 61     |
| <i>Rhodomela lycopodioides</i> . . . . .  | 99   | 50     | <i>Sphærozyga Berkeleyana</i> . . . . .      | 384  | 173    |
| <i>subfusca</i> . . . . .                 | 100  | 264    | <i>Broomei</i> . . . . .                     | 383  | 173    |
| <i>Rhodymenia bifida</i> . . . . .        | 177  | 32     | <i>Carmichaelii</i> . . . . .                | 381  | 113    |
| <i>ciliata</i> . . . . .                  | 181  | 127    | <i>Ralfsii</i> . . . . .                     | 385  |        |
| <i>cristata</i> . . . . .                 | 180  | 307    | <i>Thwaitesii</i> . . . . .                  | 382  | 113    |
| <i>jubata</i> . . . . .                   | 182  | 175    | <i>Spirulina Hutchinsiae</i> . . . . .       | 379  |        |
| <i>laciniata</i> . . . . .                | 178  | 121    | <i>tenuissima</i> . . . . .                  | 378  | 105    |
| <i>palmata</i> . . . . .                  | 183  | 217    | <i>Sporochnus pedunculatus</i> . . . . .     | 21   | 56     |
| <i>Palmetta</i> . . . . .                 | 179  | 134    | <i>Spyridia filamentosa</i> . . . . .        | 239  | 46     |
| <i>Rivularia applanata</i> . . . . .      | 352  |        | <i>Striaria attenuata</i> . . . . .          | 42   | 25     |
| <i>atra</i> . . . . .                     | 351  | 239    | <i>Stenogramme interrupta</i> . . . . .      | 176  | 157    |
| <i>nitida</i> . . . . .                   | 353  | 68     | <i>Stilophora Lyngbyæi</i> . . . . .         | 40   | 237    |
| <i>plicata</i> . . . . .                  | 350  | 315    | <i>rhizodes</i> . . . . .                    | 39   | 70     |
| <i>Rytiplhæa complanata</i> . . . . .     | 103  | 170    | <i>Taonia atomaria</i> . . . . .             | 37   | 1      |
| <i>fruticulosa</i> . . . . .              | 105  | 220    | <i>Ulva Lactuca</i> . . . . .                | 341  | 243    |
| <i>pinastroides</i> . . . . .             | 102  | 85     | <i>latissima</i> . . . . .                   | 340  | 171    |
| <i>thuyoides</i> . . . . .                | 104  | 221    | <i>Linza</i> . . . . .                       | 342  | 39     |
| <i>Sargassum bacciferum</i> . . . . .     | 2    | 109    | <i>Vaucheria marina</i> . . . . .            | 287  | 350    |
| <i>vulgare</i> . . . . .                  | 1    | 343    | <i>submarina</i> . . . . .                   | 286  | 350    |
| <i>Schizosiphon Warreniæ</i> . . . . .    | 354  | 316    | <i>velutina</i> . . . . .                    | 288  | 321    |
| <i>Schizothrix Cresswellii</i> . . . . .  | 355  | 160    | <i>Wrangelia multifida</i> . . . . .         | 247  | 27     |
| <i>Seirospora Griffithsiana</i> . . . . . | 248  | 21     | <i>Zonaria collaris</i> . . . . .            | 35   | 359    |
| <i>Spermosira Harveyana</i> . . . . .     | 387  | 173    | <i>parvula</i> . . . . .                     | 36   | 341    |
| <i>litorea</i> . . . . .                  | 386  | 113    |                                              |      |        |











PLATE I.

DICTYOTA ATOMARIA, *Grev.*

GEN. CHAR. *Root*, a mass of woolly fibres. *Frond* flat, membranaceous, ribless, reticulated, dichotomous or irregularly cleft. *Fructification* consisting of scattered or clustered somewhat prominent seeds on both surfaces of the frond.

DICTYOTA *atomaria*; *frond* broadly wedge-shaped, or somewhat fan-shaped, deeply and irregularly cleft longitudinally; seeds forming waved transverse lines, with intermediate broken ones.

DICTYOTA *atomaria*, *Grev. Alg. Brit.* p. 58. *Hook. Br. Fl.* vol. ii. p. 280. *Wyatt. Alg. Danm.* no. 60. *Endl. 3rd Suppl.* p. 24. *Harv. Manual*, p. 32. *J. Ag. Alg. Medit.* p. 37. *Menegh. Alg. Ital.* vol. i. p. 229.

DICTYOTA *zonata*, *Lamour. Es.* p. 57.

DICTYOTA *ciliata*, *Lamour. Es.* p. 58.

ZONARIA *atomaria*, *Ag. Sp. Alg.* vol. i. p. 128. *Ag. Syst.* p. 264. *Grev. Fl. Edin.* p. 298. *Gray, Br. Pl.* vol. i. p. 341.

PADINA *atomaria*, *Montag. Fl. Canar. Pl. Cell.* p. 146.

PADINA *phasiana*, *Bory, Fl. Pelop.* p. 75.

STYPOPODIUM *atomarium*, *Kütz. Phyc. Gen.* p. 341.

ULVA *atomaria*, *Woodw. in Linn. Trans.* vol. iii. p. 53. *Eng. Bot. t.* 419.

ULVA *serrata*, *DeCand. Fl. Fran.* vol. ii. p. 11. *Encycl. Bot.* vol. viii. p. 166.

HAB. On marine rocks, rare. Annual. Summer. At Cromer, *Mr. Wigg*. Corton and Gunton, *Mrs. Fowler*. Worm's Head, Glamorganshire, *Mr. Dillwyn*. Coast of Devon, *Mrs. Griffiths*. Sussex, *Mr. Borrer*. Frith of Forth, *Dr. Greville*. Ballycotton, coast of Cork, *Miss Ball*.

GEOGR. DISTR. West Indies, *Lamouroux*. Canary Islands, rare, *Despréaux*. Mediterranean Sea, *Agardh*. German Ocean. Atlantic Coasts of France and Spain.

DESC. *Root*, a broad mass of woolly, entangled, brown fibres. *Fronds* clustered, from 3 to 12 inches long, and from half an inch to 3 inches wide, delicately membranaceous, translucent, pale olive-green above, becoming darker towards the base, glossy, broadly wedge-shaped, variously cleft from the apex downwards, sometimes very much jagged, never quite entire; the lateral margins either entire or ciliato-dentate; the tips of the laciniae truncate. *Seeds* disposed in dark brown wavy transverse bands, running across the whole frond, at intervals of less than an inch, the spaces between more or less densely mottled with broken lines or irregular spots of seeds.

This beautiful plant was discovered towards the end of the last century by Mr. Lilly Wigg, on the coast of Norfolk, and first published in the third volume of the Linnæan Transactions by



Mr. Woodward, whose paper was read December 2nd, 1794. In 1797 a figure of it appeared in the "English Botany," notwithstanding which in 1804 in the list of Spanish Algæ appended to Clemente's "Essai sur les variétés de la vigne," &c., and again in 1805, in De Candolle's 'Flore Française' we find two new names bestowed upon it. Since then, as will be seen from the above synonymes, (and we have not quoted all) authors have sufficiently exercised their fancy and invention in re-naming it. Of the newer names, Bory's "*phasiana*" is the most appropriate, the brown bars on the frond reminding us of the plumage of a pheasant, and could we with propriety adopt any, it would be this one. But in justice to the original describer, and following Agardh and most recent authors we adhere to the specific name under which it was first made known.

Though widely distributed along the shores of the Northern Atlantic from the tropics to lat. 56° north, it is nowhere very common. Specimens from Dominica, given to me by Dr. Greville, are of a darker colour than British ones, and much more regularly banded, the broken bars, which generally cover the spaces between the perfect bands, being very few. In England it is completely a summer plant, reaching its perfection in July and decaying before the end of September, at which season it has lost its glossy surface, rich colours, and much of its delicacy. Its remains are then coarse, almost coriaceous, dirty brown and ragged, and would scarcely be taken by a stranger to be the same species.

While it agrees with others of the genus *Dictyota* in the structure of the frond and in the fructification, it exhibits in general habit an approach to *Padina*, or perhaps more nearly to the restricted genus *Zonaria*, J. Ag., and has been referred by Montagne as well as by Bory to the former genus. I admit that it is a transition species, especially resembling *Padina* in the banded arrangement of its seeds, but notwithstanding minor differences, the aggregate of its characters, in my opinion, compel us to refer it to *Dictyota*, unless with Kützinger, we cut the knot by constructing a new genus for its home.

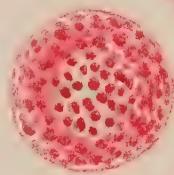
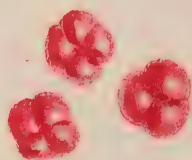
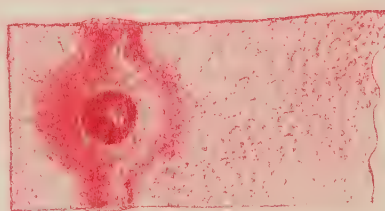
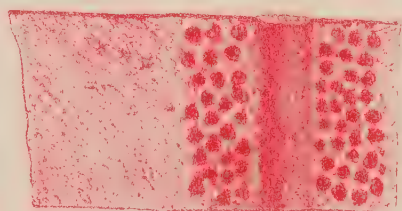
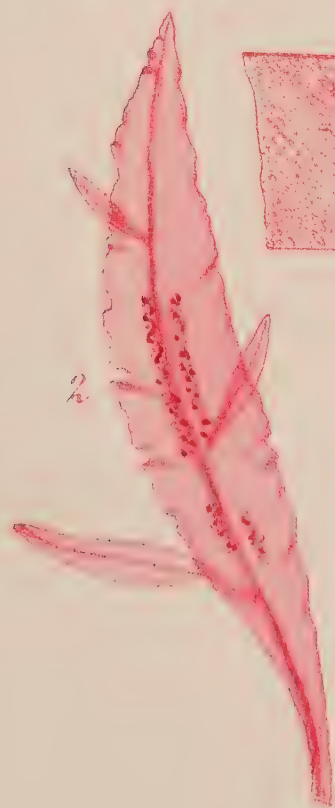
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Fig. 1. *DICTYOTA ATOMARIA* :—*natural size*. 2. Portion of sorus. 3. Seeds in situ. 4. Seeds removed :—*magnified*.

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7



## PLATE II.

DELESSERIA HYPOGLOSSUM, *Ag.*

GEN. CHAR. *Fron*d rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular seeds; 2, *granules* (*tetraspores*) forming defined spots in the frond, or in leaf-like processes.

DELESSERIA *Hypoglossum*; *frond* linear-lanceolate, tapering at each end, repeatedly proliferous from the midrib, with leaflets of similar form; tubercles on the midribs of the smaller leaflets; granules forming linear spots at each side of the midrib.

DELESSERIA *Hypoglossum*, *Ag. Sp. Alg.* vol. i. p. 176. *Syst.* p. 249. *Grev. Fl. Edin.* p. 293. *Alg. Brit.* p. 75. t. 12. *Hook. Br. Fl.* vol. ii. p. 286. *Mack. Fl. Hib.* vol. iii. p. 191. *Harv. Man.* p. 56. *Wyatt. Alg. Danm.* no. 63. *J. Ag. Medit.* p. 157. *Endl. 3rd Suppl.* p. 52. *Montag. Pl. Cell. Canar.* p. 150.

DELESSERIA *Hypoglossum*, *Lamour. Ann. Mus.* xx. p. 124.

WORMSKIOLDIA *Hypoglossum*, *Spreng. Syst. Veg.* vol. iv. p. 331.

HYPOGLOSSUM *Woodwardii*, *Kütz. Ph. Gen.* p. 444. t. 65. f. 1.

FUCUS *Hypoglossum*, *Woodw. in Linn. Trans.* vol. ii. p. 30. t. 7. *Linn. Trans.* vol. iii. p. 113. *With.* vol. iv. p. 95. *Eng. Bot.* t. 1396. *Turn. Syn. Fuc.* vol. i. p. 17. *Hist.* t. 14. *Esp. Ic. Fuc.* vol. ii. p. 17. t. 120.

FUCUS *hypoglossoides*, *Stack. Ner. Brit.* p. 76. t. 13.

ULVA *lingulata*, *De Cand. Fl. Fran. 2nd edit.* vol. ii. p. 14.

HAB. In the sea, on rocks and Algæ. Annual. Summer. Frequent on the shores of England and Ireland; rare in Scotland.

GEOGR. DISTR. Atlantic shores of Europe, frequent. Rare in the Mediterranean, and of small size. Canary Islands, *Webb*.

DESC. *Root*, a minute disc. *Fron*ds tufted, consisting of a primary leaf 2–8 inches in length, and from a line to half an inch in breadth, linear-lanceolate, rose-red and membranous, with a distinct midrib, and faint traces of obliquely transverse striæ, throwing out from its midrib numerous similar leaves, which again produce others, until the plant becomes exceedingly bushy and of a globular figure. The apices of the leaflets are more or less tapering or acute. If placed in fresh water the colouring matter is soon discharged. The tubercles are globose, forming a dark-red swelling in the substance of the midribs of the smaller leaflets, generally about their centre, and contain a large number of minute seeds; and the granules form linear patches along the midribs of the leaves of distinct, and generally more luxuriant, plants.

Our figure, which represents a larger state of the plant than is commonly met with, though by no means the largest we have



seen, is taken from a specimen collected by the late Miss Hutchins in Bantry Bay. In that favoured locality and in other situations on the west coast of Ireland, and also at Larne near Belfast on the north-east coast, very luxuriant specimens are often met with in company with others as narrow and bushy as are commonly seen on the south coast of England. It varies indeed greatly in size, the frond being sometimes scarcely a line in width, sometimes nearly half an inch; but its admirable distinguishing character, that of being repeatedly proliferous from the midrib, is invariable. The only British plant with which a young botanist can confound it, is the somewhat rarer *D. ruscifolia*, from which its thinner substance, brighter colour, proportionally narrower leaves, and the lanceolate, not linear-oblong, form of the leaflets distinguish it.

The first notice of the species was by Dr. Solander who named a specimen in the Banksian Herbarium, the native country of which was unknown. Mr. Wigg having about the year 1794 found it on the Norfolk shores, it was published in the 'Linnæan Transactions,' as a British plant, and is now well known to occur in tolerable plenty on most of the European coasts. I have not seen any American specimens, nor is it found in the Southern Ocean. A species does indeed occur on several of the Antarctic Coasts, as at Auckland Island, Kerguelen's Land, Cape Horn and the Falkland Islands, which agrees in very many respects with *D. Hypoglossum*, having the same general habit, the same lanceolate leaves and the same proliferous growth; but in it (*D. crassinervia*, Mont) the midribs of the leaves are usually very much broader and thicker. I fear, however, that this character is not a very constant one, some Falkland Island individuals having a much less broad midrib than others, or than the original Auckland specimens, and I am almost disposed to regard the Southern plant as more properly a variety of the present species than specifically distinct.

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Fig. 1. *DELESSERIA HYPOGLOSSUM*:—*natural size*. 2. Leaflet with tetraspores. 3. Section of ditto, showing part of the sorus. 4. Tetraspores separated. 5. Leaflet, with tubercles. 6. Section of ditto. 7. Tubercle removed. 8. Seeds from tubercle:—all *magnified*.

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## PLATE III.

BRYOPSIS PLUMOSA, *Ag.*

GEN. CHAR. *Frond* membranaceous, filiform, tubular, cylindrical, glistening, branched; the branches imbricated or distichous and pinnated, filled with a fine green, minutely granuliferous fluid. *Grev.*

BRYOPSIS *plumosa*; *frond* having a triangular outline, naked below, branched above, branches spreading, their upper half pectinato-pinnated, pinnales subdistichous.

BRYOPSIS *plumosa*, *Ag. Sp. Alg.* vol. i. p. 448. *Syst.* p. 178. *Grev. Fl. Edin.* p. 307. *Alg. Brit.* p. 187. t. 19. *Hook. Br. Fl.* vol. ii. p. 318. *Harv. Man.* p. 146. *Wyatt. Alg. Danm.* no. 128. *J. Ag. Alg. Medit.* p. 21. *Endl. 3rd Suppl.* p. 20. *Mart. Fl. Braz.* vol. i. p. 11. *Kütz. Ph. Gen.* p. 306.

BRYOPSIS *Lyngbyæi*, *Fl. Dan.* t. 1063. *Lyngb. Hyd. Dan.* p. 75. t. 19. *Spreng. Syst. Veg.* vol. iv. p. 365.

ULVA *plumosa*, *Huds. Fl. Ang.* p. 571. *Eng. Bot.* t. 2375.

HAB. In the sea, on rocks and small stones. Annual. Summer and Autumn. Frequent on the shores of the British Islands.

GEOGR. DISTR. Along the Atlantic shores of Europe from the Færoe Islands to Spain. Mediterranean Sea, *J. Agardh.* South Brazil, *Martius.* Falkland Islands, *Dr. Hooker.* Cape of Good Hope, *W. H. H.*

DESC. *Root* composed of irregular entangled filaments. *Fronds* several from the same base, at first perfectly simple, straight and thread-like till they become half an inch to an inch in length, at which period they commence to form lateral branchlets in the upper half. In this state the whole plant resembles a little feather. Afterwards the naked part of the stem lengthens, and its ramuli grow out into branches 1–3 inches long and about half a line in diameter, producing, by a repetition of the primary mode of growth, several series of lesser branches, until a much branched frond results. Then, owing to the lower branches being long, and the upper gradually diminishing to the summit, the general outline is triangular or pyramidal. In every stage, however, the branches, naked below and feathered above, afford a sufficiently distinguishing character. The substance is exceedingly glossy, flaccid, and easily injured, and the colour a rich deep green. Each branch consists of a single cellule, and on wounding the outer membrane discharges its contents in the form of a granular thick fluid. In drying it adheres most closely to paper, and has a varnished appearance.

A very widely distributed plant found plentifully throughout both the temperate zones, and even in some of the warmer seas. It is perhaps also a native of the tropics, the West Indian *B. pen-*



*nata* of Lamouroux, being possibly a synonyme. Be this as it may, species of *Bryopsis* have been found in all parts of the world, and they resemble each other so closely, that except in a few instances it is very difficult at all times to determine to what particular *book species* individuals should be referred.

Though having all the softness of texture and brilliant green colouring of the *Confervæ*, the *Bryopsides* must be regarded as holding a still lower rank in the Vegetable Kingdom, and approaching very nearly to those organisms that seem uncertain under which banner to arrange themselves, whether Animal or Vegetable. Viewed by itself indeed *Bryopsis plumosa* appears as perfect a vegetable as any, but taken in connection with neighbouring nearly allied structures *Dasycladus*, *Caulerpa*, *Polyphysa*, *Halimeda*, *Struvea*, &c., it is found to approach much more closely to the confines than would at first sight be supposed.

The first notice we find taken of this elegant plant is by Hudson in whose 'Flora Anglica' it appears under the specific name by which it is most generally known.

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Fig. 1. BRYOPSIS PLUMOSA :—*natural size*. 2. Branch. 3. Apex of ditto.  
4. Section of branch and ramulus :—all *magnified*.

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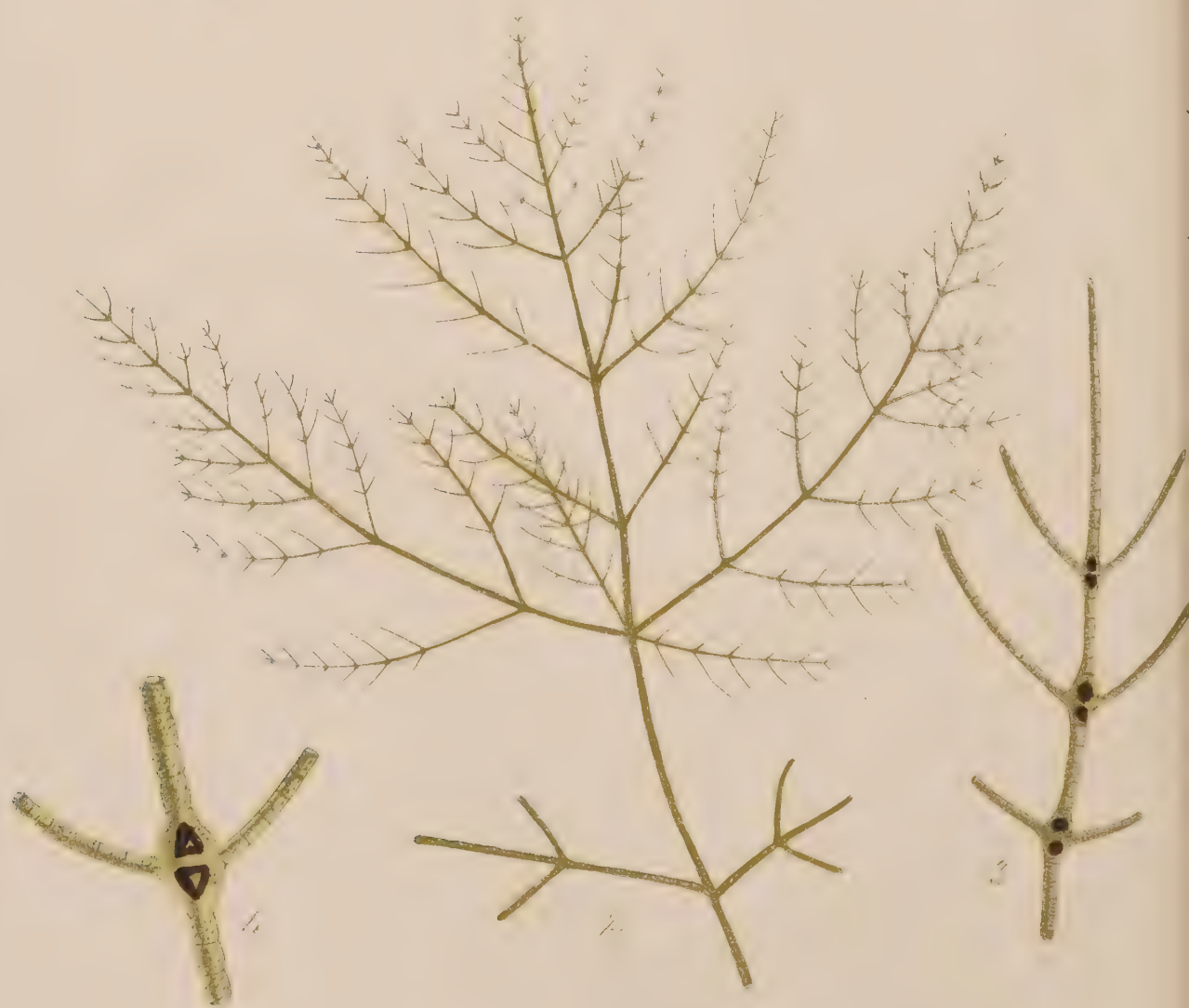
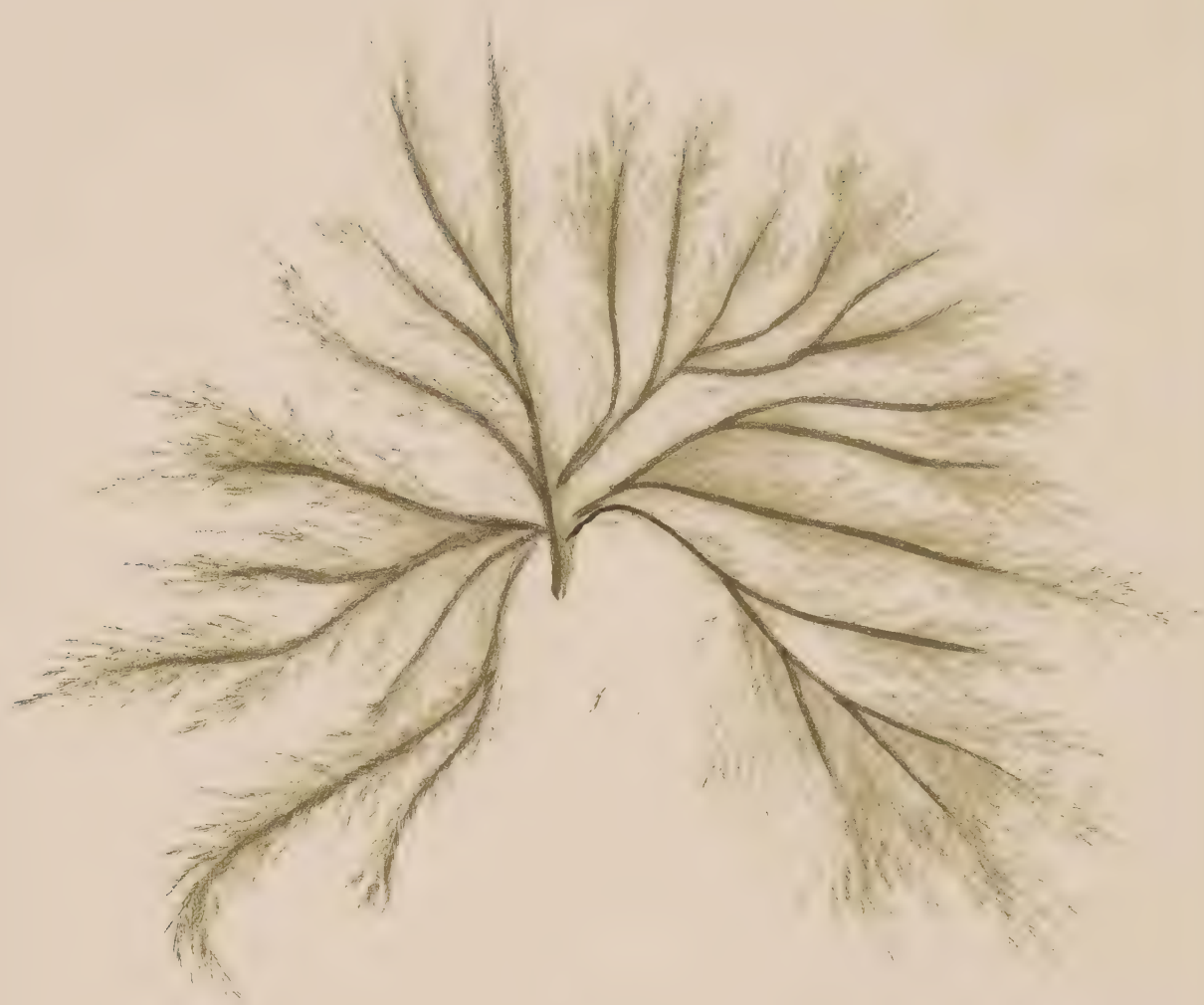


PLATE IV.

ECTOCARPUS BRACHIATUS, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olive or brown, flaccid, single tubed. *Fruit*; either spherical, elliptical, or lanceolate capsules borne on the ramuli, or imbedded in their substance.

ECTOCARPUS *brachiatus*; *frond* finely tufted, feathery, much branched; the branches free, opposite or quaternate; ramuli opposite, spreading; capsules imbedded in the branches, forming oblong swellings situated on the lesser branches or in the axils of two opposite ramuli.

ECTOCARPUS *brachiatus*, *Harv. in Hook. Br. Fl.* vol. ii. p. 326. *Man.* p. 42. *Wyatt. Alg. Danm.* no. 174.

ECTOCARPUS *cruciatus*, *Ag. Sp. Alg.* vol. iii. p. 44. *Endl. 3rd Suppl.* p. 21.

CONFERVA *brachiata*, *Eng. Bot.* t. 2571.

HAB. Rare. At Cley, on the coast of Norfolk, in ditches of brackish water, among *Enteromorpha compressa*, 1808, *Sir W. J. Hooker*; in the sea, growing on *Rhodomenia palmata*, at Torquay, *Mrs. Griffiths*. Youghall, July 1837, *Miss Ball*. Lambray, 1838, *Mr. W. Thompson*.

GEOGR. DISTR. Only known on the coast of England, and east and south of Ireland.

DESC. *Frond* 2–4 inches high, finely tufted, wavy and feathery; the main stems slightly entangled, excessively branched, all the branches and branchlets opposite or quaternate; the lesser branches generally naked below, but furnished in their upper half with one or two pair of opposite spreading ramuli, which are in like manner furnished with similar smaller ones. *Capsules* immersed in the joints of the branches, often containing a double or bipartite mass, usually situate at the nodes of the branchlets. Colour a pale olive green.

There is some confusion in the history of this plant, which is one reason why I give it an early figure in this work. In the year 1801, Mr. Dawson Turner, and in 1808, Sir W. J. Hooker, found in ditches of brackish water by the sea side on the Norfolk coast a plant of which a figure and description appeared in the ‘English Botany’ under the name of *Conferva brachiata*. That figure evidently represents a species of *Ectocarpus*, having opposite branches and immersed fruit. The Norfolk plant has not been found of late years, and no specimen now exists in Sir W. J. Hooker’s Herbarium. The English Botany plate consequently remained for many years the only record of the species, until Mrs.



Griffiths discovered in Torbay a plant possessing apparently the leading or *essential* characters of the Norfolk one, but growing in the open sea and always as a parasite on *Rhodomenia palmata*. Meanwhile Agardh described a new *Ectocarpus brachiatus*, a native of the Baltic, and conferred the name *E. cruciatus* on the E. Bot. species. The name *brachiatus* no doubt belongs to the Norfolk plant, and if the Torbay individuals now figured and described, and of which excellent specimens have been published in Mrs. Wyatt's "*Alga Danmoniensis*" are essentially different, a new name should be conferred on them; and Agardh's *E. brachiatus*, if it be not the same with *E. sphærophorus*, Carm., might be called *E. Agardhianus*.

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Fig. 1. ECTOCARPUS BRACHIATUS:—*natural size*. 2. A portion of the frond:—*magnified*. 3. Apex of a branch. 4. Fragment, to show the imbedded fruit:—*more highly magnified*.

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## PLATE V.

CALLITHAMNION GRACILLIMUM, *Ag.*

GEN. CHAR. *Fronde* rosy, or brownish red, filamentous; *stem* either opaque and cellular or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit*: 1, external *tetraspores*, with colourless borders, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous seeds.

CALLITHAMNION *gracillimum*; *frond* distichously branched, fan-shaped; stems capillary, decomposito-pinnate; upper plumules long, narrow, ovate or lanceolate, spreading, bi-tri-pinnate; joints of the stem cylindrical, three or four times, of the pinnæ two or three times longer than broad, veinless; tetraspores borne on the tips of the pinnules.

CALLITHAMNION *gracillimum*, *Ag. Sp. Alg.* vol. ii. p. 168. *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Wyatt. Alg. Danm.* no. 45. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 372.

HAB. Very rare. On mud-covered perpendicular rocks, near low-water mark. Annual. Summer. On the pier at Torquay, *Mrs. Griffiths*. Milford Haven, *Mr. Ralfs*. Falmouth, *Miss Warren*.

GEOGR. DISTR. Atlantic coast of France, *Grateloup*. South and west of England.

DESC. *Fronde*s tufted, 1–4 inches high, exceedingly slender, distichous, irregularly branched; main branches rather few, simple, 1–2 inches long, unequally but closely plumulate along their whole length, having an ovate or lanceolate figure, and all attenuated at the point. Lower plumules short, vaguely pinnate; upper elongate, lanceolate, spreading, bi-tri-pinnate. All the divisions alternate, and a branchlet usually springing from every joint. The colour, when quite recent, is a deep red, becoming rose-red in fresh water, and if kept long in that medium the frond discharges a quantity of brilliant carmine powder, which permanently stains paper. Tetraspores very minute, elliptical, borne on the tips of shortened pinnulæ. *Favellæ* roundish or irregularly lobed, springing from the larger branches. Substance delicately membranaceous and flaccid, closely adhering to paper.

This extremely elegant plant, perhaps truly the *most graceful* of the very beautiful genus to which it belongs, was first gathered on the shores of France by M. Grateloup, who communicated specimens to the elder Agardh, by whom it was published in the year 1828. Shortly afterwards the indefatigable Mrs. Griffiths



discovered magnificent specimens growing along the mud-covered base of the harbour pier at Torquay, in which locality it may be found in more or less plenty every summer. More recently it has been found in Wales and Cornwall. From Mrs. Griffiths it received the very appropriate name of "*Fern-leaf*," aptly expressing the finely pinnated character of the branches, which do indeed closely resemble fairy ferns, so delicate that it is altogether impossible in a figure to do justice to their beauty. Our representation of the natural size must therefore be regarded as merely giving the general effect of a specimen held at arms length from the eye.

As a species, it is very closely related to *Cal. thuyoides*, with which it agrees in many characters, but from which it may be known by the greater proportionate length and breadth of the plumules, their more distichous arrangement and closer position; the shorter and more cylindrical joints of the main branches, and larger size of the frond. Both species agree in producing their *tetraspores* on the tips of the ultimate ramuli, a character by which they differ from all other British species with compound-pinnate fronds.

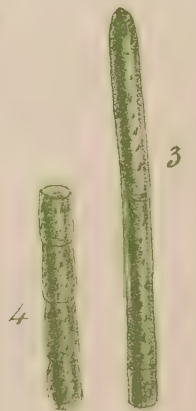
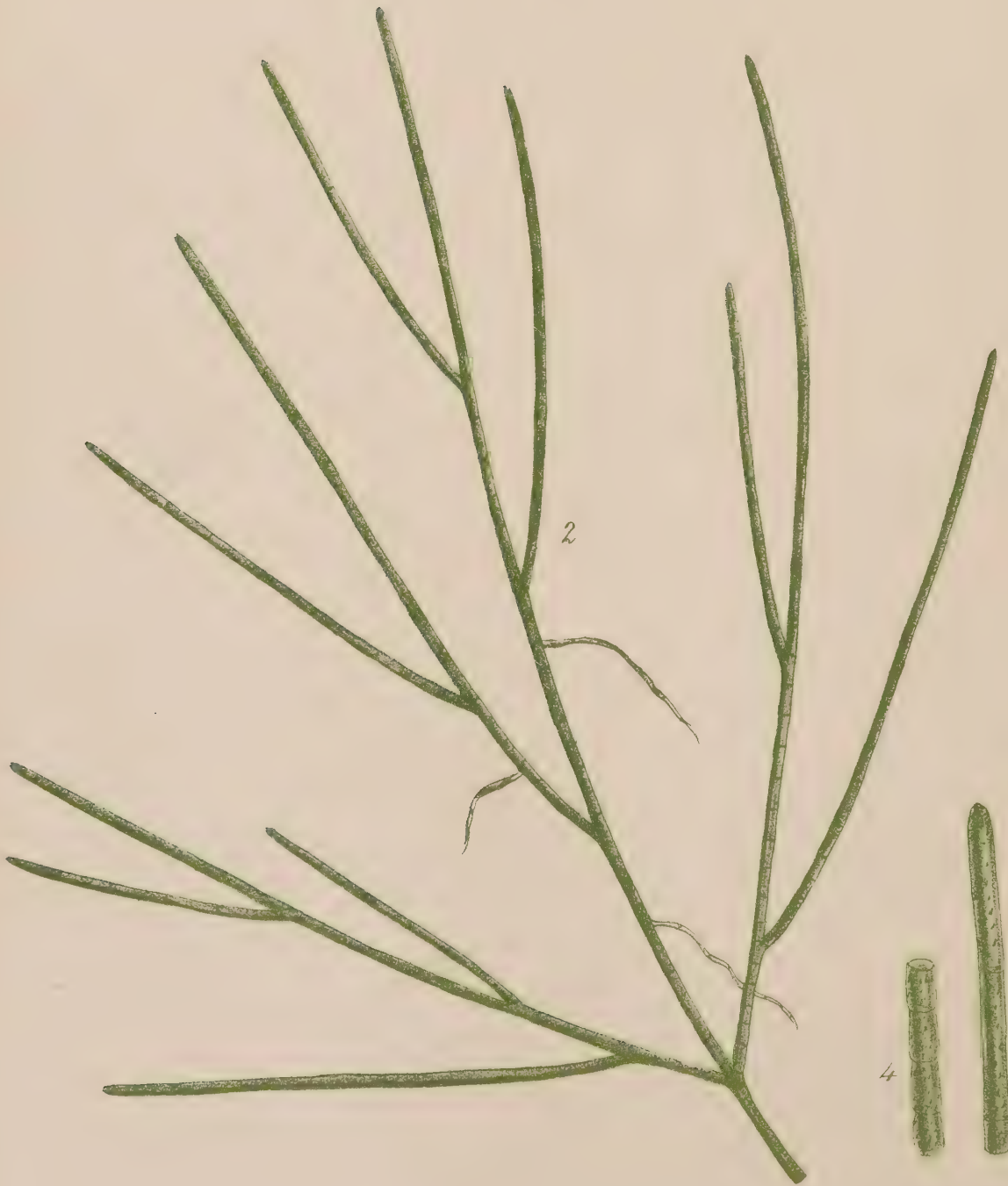
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Fig. 1. *CALLITHAMNION GRACILLIMUM*:—*natural size*. 2. A plumule: *magnified*. 3. Ramulus with tetraspores. 4. Ramulus with a favella. 5. Portion of a favella ruptured, and discharging seeds. 6. Tetraspores removed and dissected:—all *more or less magnified*.

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## PLATE VI.

CLADOPHORA LANOSA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*; aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion.

CLADOPHORA *lanosa*; *Filaments* slender, short, yellow green, forming dense globular tufts; branches virgate, erect, subdistant, straight, alternate or rarely opposite; ramuli few, alternate or secund; axils very acute; lower joints twice, upper six times, as long as broad.

CLADOPHORA *lanosa*, *Kütz. Phyc. Gen.* p. 269.

CONFERVA *lanosa*, *Roth. Cat. Bot.* vol. iii. p. 291. t. 9. *Sm. E. Bot.* t. 2099.

*Lyngb. Hyd. Dan.* p. 160. t. 56. *Dillw. Conf. t. E. Ag. Syst. Alg.* p. 112.

*Grev. Fl. Edin.* p. 316. *Harv. in Hook. Br. Fl.* vol. ii. p. 358. *Man.* p. 138.

*Wyatt. Alg. Danm.* no. 194.

HAB. In the sea, on rocks, or, more frequently, on the larger Fuci. Frequent on the shores of the British Islands.

GEOGR. DISTR. Northern Atlantic shores of Europe. Baltic sea.

DESC. *Tufts* 1-2 inches in diameter, globose, made up of innumerable slender entangled filaments radiating from a centre. Filaments stoloniferous below, or sending out, here and there, irregular root-like imperfectly jointed processes; branches few, straight and erect. Joints of the lower part of the filament short, once or twice as long as broad; those of the upper branches very long. When dried on paper, to which it adheres more or less closely, it is wholly without gloss, and faded to a whitish green, except round the circumference where it usually retains a glaucous or verdigris colour. The endochrome is very fluid and not well preserved in drying.

This plant is found in abundance on most of the Atlantic shores of Europe, inhabiting the old stems of *Fucus serratus* and *F. vesiculosus*, the leaves of *Zostera marina*, and occasionally, but far less frequently, growing on submarine rocks and stones. It is decidedly found in greater perfection and abundance as we proceed northwards, and on the west coast of Scotland the finest specimens we have seen are gathered. From one of these, collected by the late Capt. Carmichael, our figure is taken.

Dr. Roth first described his *Conferva lanosa* in the third part of his 'Catalecta Botanica,' published in 1806; and soon afterwards Mr. Dillwyn introduced it to the notice of British Botanists in the

Supplement to his work on Confervæ. It does not appear to have been noticed by earlier writers. It is very closely related to *C. arcta* and *C. uncialis*, from the former of which it differs chiefly by its smaller size and less branching filaments, and from the latter more by habit than by any very decided characters. The so-called *species* of the genus *Cladophora* ought, in many cases, to be regarded more properly as tolerably constant *forms* or varieties, than truly distinct organisms; but as similar doubts of the validity of species encumber the nomenclature of plants far higher in the system, we may the more readily tolerate them here.

The proper time has, perhaps, arrived for dismembering the old genus *Conferva*, Ag., as proposed by several continental authors and carried out in this country by Mr. Hassall in his "Fresh-water Algæ." Kützing, whose name *Cladophora* I here adopt (although in strict justice *Chloroniton*, Gaill., ought to be preserved), distributes the Agardhian Confervæ into twelve genera, six of which only concern the British Flora. Of these *Edogonium*, Link, is identical with Mr. Hassall's *Vesiculifera*, and with the still older *Tiresias*, Bory, which latter name should be adopted. *Conferva* is retained for the species with simple threads, whose fruit is imperfectly known. *Rhizogonium* is proposed for *Conf. riparia*, Ag., and its allies; while *Ægagropila*, founded on *C. ægagropila* and *Spongomorpha*, on *C. uncialis*, I include in the genus now called *Cladophora*. It would be clearly a most artificial arrangement to separate *C. uncialis* generically from *C. lanosa* and *C. arcta*.

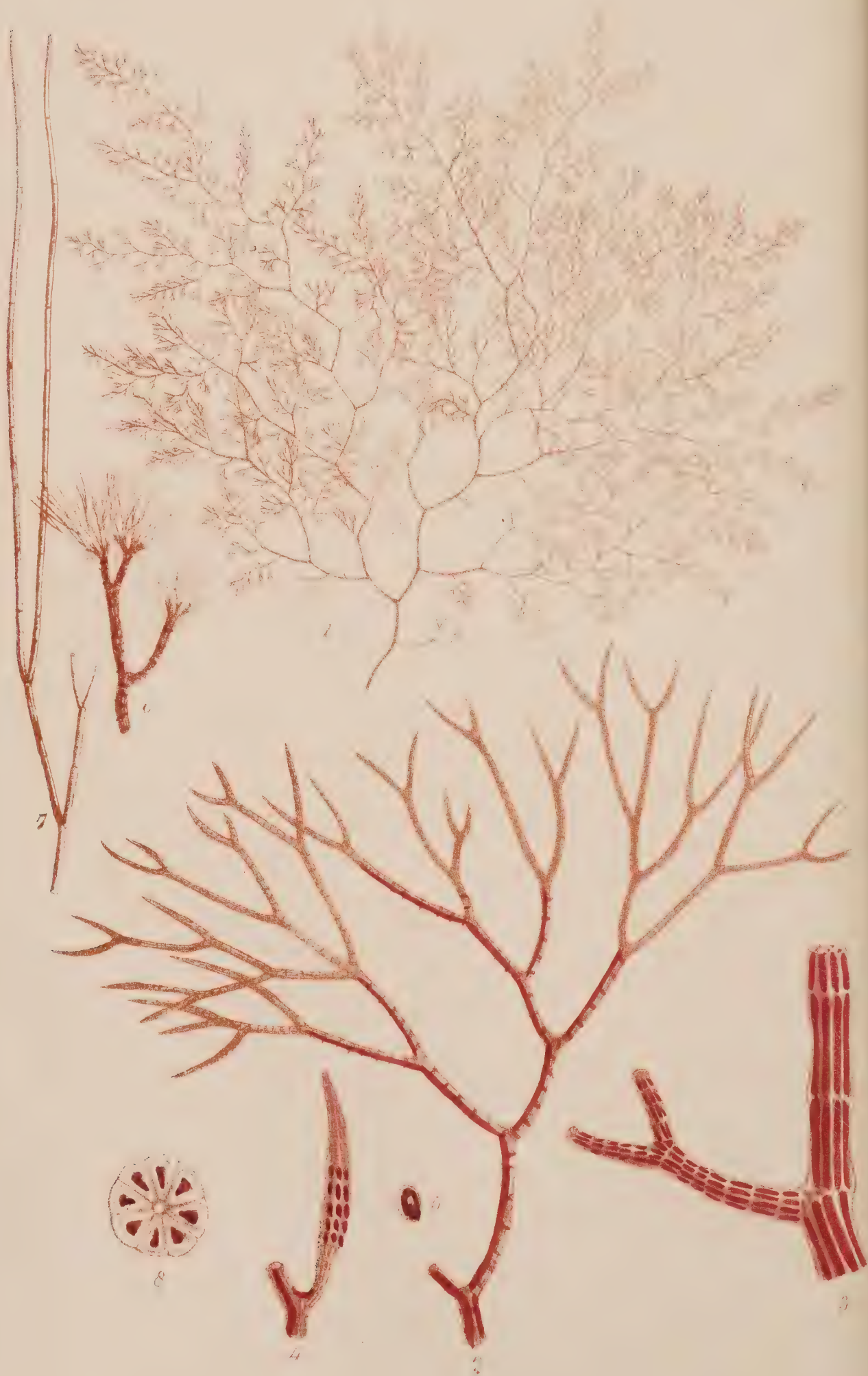
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Fig. 1. CLADOPHORA LANOSA :—*natural size*. 2. Portion of a filament 3. Portion of the lower part of a filament. 4. Apex of ditto :—*magnified*.

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## PLATE VII.

POLYSIPHONIA FURCELLATA, *Harv.*

GEN. CHAR. *Frond* filamentous, partially or generally articulate; joints longitudinally striate, composed internally of parallel tubes or elongated cellules. *Fructification* twofold, on distinct plants: 1, ovate capsules (*ceramidia*) furnished with a terminal pore, and containing a mass of pear-shaped seeds; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA—from *πολύς*, *many*, and *σίφων*, *a tube*; because the axis of the frond is composed of several tubes.

POLYSIPHONIA *furcellata*; *filaments* elongated, tufted, flexuous, repeatedly and closely dichotomous; axils broad, rounded; ramuli erect, their points somewhat hooked in; joints of the stem three to five times longer than broad.

POLYSIPHONIA *furcellata*, *Harv. in Hook. Br. Fl.* vol. ii. p. 332. *Man.* p. 90. *Montag. Pl. Cell. Canar.* p. 172. *Endl. 3rd Suppl.* p. 45. *Kütz. Ph. Gen.* p. 425.

HUTCHINSIA *furcellata*, *Ag. Sp. Alg.* vol. ii. p. 91.

LAMOUROUXIA *turgidula*, *Bonnem. MSS. sec. Ag.*

HAB. Very rare. Floating in the sea, at Sidmouth, *Mrs. Griffiths* and *Miss Cutler*. Dredged in Torbay, *Mrs. Griffiths*. Carrickfergus, *Mr. W. M'Calla* (1845). Annual. Summer.

GEOGR. DISTR. Atlantic shores of France, *Messrs. Bonnemaison* and *Chauvin*, sec. *Ag.* South shore of England. Canary Islands, *Webb*. North-east of Ireland.

DESC. *Filaments* as thick as hogs bristle in the lower part, gradually attenuated, 5–6 inches long, densely tufted and frequently much entangled, excessively branched, flexuous or zig-zag, the divisions pretty regularly dichotomous, the lower ones subdistant, the upper gradually becoming nearer to each other towards the extremities. Axils all remarkably wide; apices either straight and subulate, or hooked in; at first simple, finally producing byssoid fibres from all the upper articulations. *Stem* composed of about eight tubiform cells surrounding a narrow central tube; walls of the cells thick, endochrome comparatively narrow. Articulations varying in length in different parts of the frond; those of the larger branches 3–5 times, of the lesser about twice, and of the ultimate ramuli as long as, or shorter than, their breadth. *Colour* when recent, “a bright brick-red,” which changes in the herbarium to a deep umber-brown. Substance, according to *Mrs. Griffiths*, “at first firm, but becoming flaccid immediately.” Capsules unknown. Tetraspores frequently occur in British specimens.

I have here the satisfaction of figuring for the first time a species as rare as it is beautiful, which, till it was recently brought by Mr. Webb from the Canary Islands, was supposed to be confined to the shores of the British Channel. It was first noticed on



the coast of Bretagne by M. Bonnemaison; and added to our Flora by Mrs. Griffiths in 1827, who gathered it freely floating in the sea opposite Sidmouth. In that locality and in Torbay it has, since that period, occasionally been picked up, but the supply is neither regular every year, nor at any time has it been abundant.

Whilst this sheet was preparing for the press Mr. M'Calla discovered a new station at Carrickfergus, in the north-east of Ireland, where he obtained three specimens, one of which is of the average size of English specimens, and fully developed, the other two in a young state. These were washed on shore in October 1845, in company with a considerable quantity of the rare *Pol. subulifera* and of *Chordaria divaricata*, Ag., a species new to the British Flora, which we shall have the pleasure of figuring in our next number.

There is no British species so nearly allied to *P. furcellata* as to be confounded with it, although when examined microscopically we perceive a considerable affinity on the one hand to *P. nigrescens*, and on the other to *P. fastigiata*. Between these two species indeed, *P. furcellata* appears to me to be almost intermediate. The relative length and the structure of the joints are very much those of *P. nigrescens*, from which the dichotomous, not pinnate, ramification, the want of leading stem, bright colour, &c., abundantly distinguish it; while, on the other hand, the ramification nearly approaches that of *P. fastigiata*; but then, the nature of the joints, the colour, and the flaccid substance are very different.

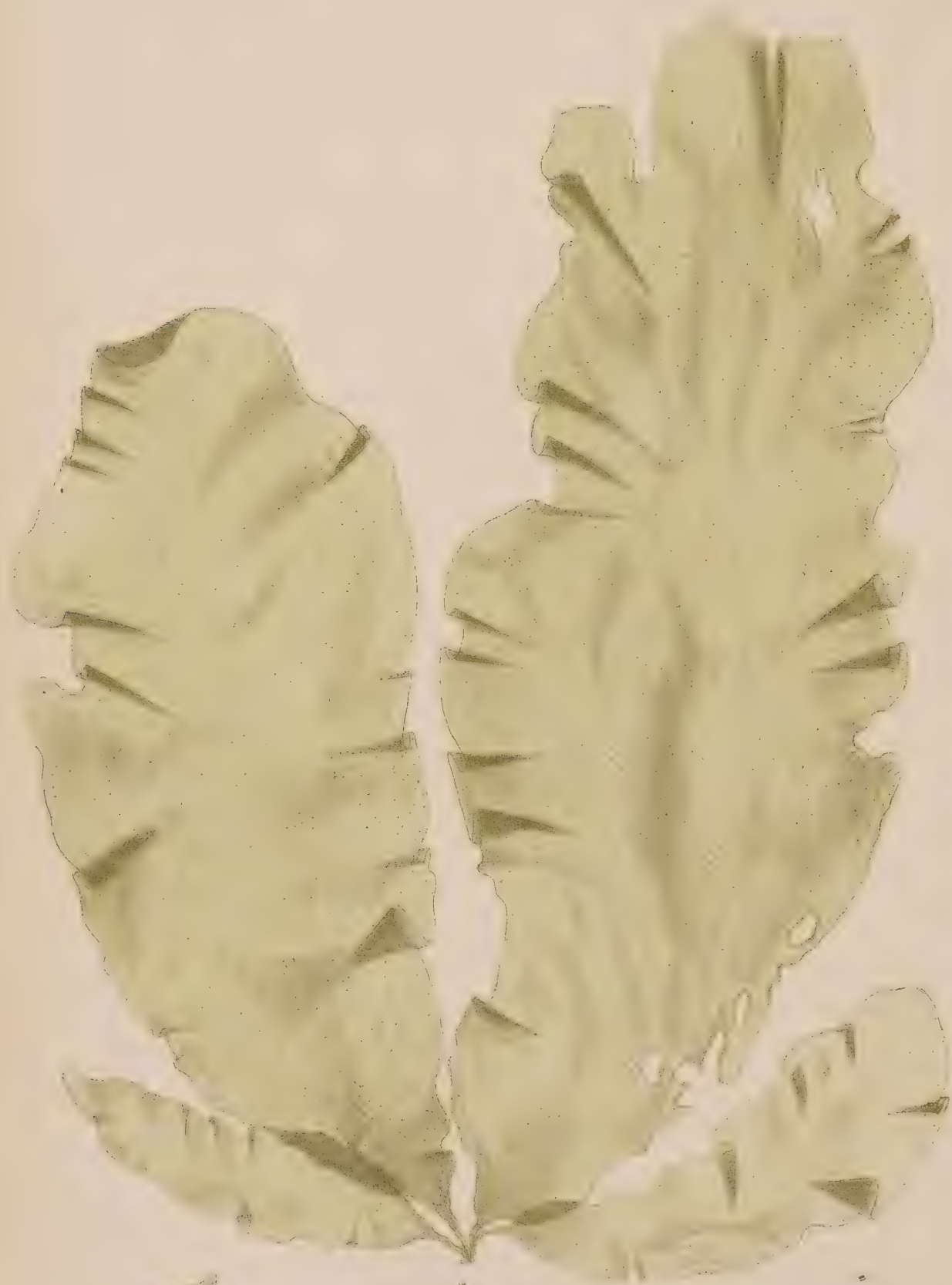
There is another species which ought to be here noticed as being closely related to *P. furcellata*, namely, *P. corymbifera*, a native of the Cape of Good Hope. This, if my specimens are correctly named, is a more robust plant, with more distant dichotomies, more acute axils, and remarkable for its densely corymbose fastigate multifid lateral branchlets, and the number of tubes contained in the stem is twelve or thirteen. It has, however, very much the habit of a luxuriant specimen of *P. furcellata*, and though truly distinct, by the above mentioned and some other minor characters, might easily, on a hasty inspection, be mistaken for that species.

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Fig. 1. POLYSIPHONIA FURCELLATA :—*natural size*. 2. Branchlet. 3. Section to show the different lengths of the joints. 4. Ramulus bearing tetraspores. 5. A tetraspore (undivided?) removed. 6. Fibrilliferous apex. 7. One of the fibrillæ. 8. Transverse section of the stem :—*all magnified*.

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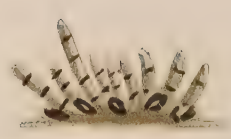




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## PLATE VIII.

## PUNCTARIA LATIFOLIA, Grev.

GEN. CHAR. *Fronde* undivided, membranaceous, flat, ribless, with a naked, scutate root. *Fructification* scattered over the whole frond in minute distinct dots, composed of roundish prominent seeds intermixed with club-shaped filaments. PUNCTARIA—from *punctum*, a dot; the fruit being in dots, scattered over the surface.

PUNCTARIA *latifolia*; *frond* oblong or obovate, suddenly tapering at the base, pale olive green, thickish, gelatinous and tender.

PUNCTARIA *latifolia*, Grev. *Alg. Brit.* p. 52. Hook. *Br. Fl.* vol. ii. p. 278. Mack. *Fl. Hib.* vol. iii. p. 176. Harv. *Man.* p. 33. Wyatt. *Alg. Danm.* no. 9. J. Ag. *Alg. Medit.* p. 41. Endl. *3rd Suppl.* p. 25. Meneg. *Alg. Ital.* p. 174. PHYCOLAPATHUM *debile*, Kütz. *Phyc. Gen.* p. 292. t. 24. II. (in part).

HAB. Rocks and stones in the sea. Annual. Summer. Sidmouth and Torquay, Mrs. Griffiths. Near Belfast, Dr. Drummond. Islay, Mr. Chalmers. West of Ireland, frequent, W. H. H.

GEOGR. DISTR. British Islands. Mediterranean sea, in several places, J. Agardh. Trieste, Herb. Hooker!

DESC. *Root*, a flat naked disk. *Fronde*s generally forming large tufts, 8–16 inches long, 1–3 inches wide, oblong or lanceolate, flat or more or less curled or wavy, generally obtuse at both extremities, occasionally tapering, when in perfection delicately membranaceous, semitransparent and somewhat gelatinous, but becoming in advanced age thicker and coarser, always of a very pale olive-green colour. Dots of fructification minute, roundish, thickly scattered over both surfaces. It closely adheres to paper if gathered in an early or middle stage of growth, but specimens collected later in the year will not adhere to paper in drying.

This species was founded in 1839 by Dr. Greville, in his admirable ‘*Algæ Britannicæ*,’ on specimens communicated by Mrs. Griffiths and Dr. Drummond, and has since been detected in tolerable plenty on several of our coasts. It is probable that by earlier botanists it was confounded with *P. plantaginea*, to which some of its varieties make a near approach in form, and with which it is often found associated in the same pool. I have specimens of both species gathered side by side by Mrs. Griffiths, who observes, that “*P. plantaginea* is much thicker than *P. lati-*

*folia*, the meshes of the reticulations longer, and the dots of fructification more oblong.” “It is much easier,” adds this acute observer, “to see the difference than to describe it in words.” The most obvious difference lies in the *colour*;—*P. plantaginea* being of a clear dark brown; *P. latifolia* always very pale. *P. plantaginea* also is usually much narrower, and greatly more tapering, truly cuneate at the base, and much less wavy; but I possess specimens as broad and as little tapering below as many referred to *P. latifolia*. Nor am I very confident, after an attentive comparison of a multitude of specimens, whether there is any absolutely distinguishing character between the two except *colour*, if that be admitted as sufficient. Late in the season *P. latifolia* becomes as coarse and thick as *P. plantaginea*, and will not in the least adhere to paper. A specimen, from Trieste, in Sir W. J. Hooker’s herbarium is identical with those from Devonshire; but Dr. J. Agardh states that his Mediterranean specimens are thicker than British ones: it is therefore obvious that the *substance* varies as much in the Mediterranean as I have observed it to do in our seas.

The genus *Punctaria* is exactly analogous among Dictyotæ to *Ulva* in Ulvaceæ, and so closely do its species resemble the *Ulvæ* in form and substance, that without reference to fructification, or without a close examination of the structure of the frond, a young botanist might sometimes confound the species of one genus with those of the other. It requires also a careful examination to distinguish at all times between *Laminaria debilis* and *Punctaria latifolia*, the form and colour of both being nearly identical. The *Laminaria* is, however, to the naked eye, more glossy and adheres much less firmly to paper; and its structure, instead of being reticulated is closely cellular.

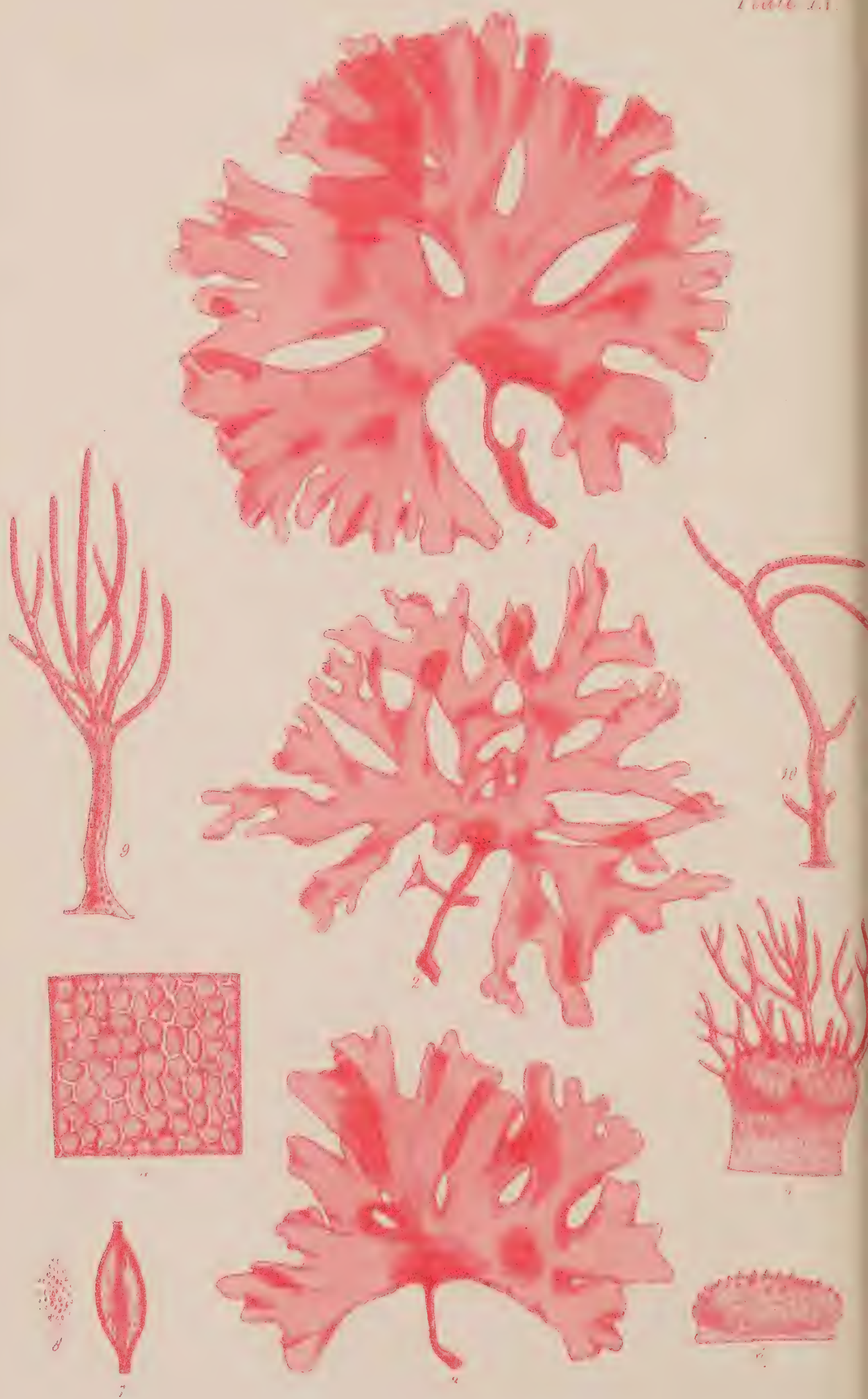
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Fig. 1. PUNCTARIA LATIFOLIA :—*natural size*. 2. Base of the frond and scutate root;—*magnified*. 3. Portion of the frond, showing the reticulated structure, and spots of fructification, vertical view;—*magnified*. 4. Sorus, lateral view;—*magnified*.

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## PLATE IX.

NITOPHYLLUM VERSICOLOR, *Harv.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins toward the base. *Fructification*, two-fold, on distinct plants: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular seeds; 2, *tetraspores* grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM—corruptly formed from *niteo*, to *shine*, and φύλλον, a *leaf*; *shining-leaf*.

NITOPHYLLUM *versicolor*; stem cartilaginous, elongated, simple or branched, suddenly expanding into a broadly fan-shaped, variously cleft frond, of a thickish-membranaceous, highly reticulate substance and rose-red colour, becoming golden-orange in fresh water; the segments rounded; the apices generally thickened, and ciliiferous; fructification unknown.

NITOPHYLLUM *versicolor*, *Harv. Manual*, p. 59.

HAB. Very rare. Thrown up, probably from deep water. Annual. June to August. Ilfracombe, *Miss Hill* (1800) and *Mrs. Griffiths*. Youghal, *Miss Ball* (1834).

GEOGR. DISTR. Southern shores of England and Ireland.

DESC. *Root* unknown. *Stems* irregularly tuberous or incrassated below, from half an inch to an inch long, fleshy, firm, cylindrical or club-shaped, 1–2 lines thick, simple or branched. The *branches* suddenly expand into broadly fan-shaped fronds 2–3 inches in breadth, and 1½–2 inches in height, more or less deeply cleft in a dichotomous manner, membranaceous and veinless. Segments in some specimens less than half an inch broad, in others above an inch, cuneate, now once or twice cleft, now many times divided, roundish at the apices, entire or minutely ciliate. The tips of the frond, and sometimes portions of the lateral margin, are much thickened, producing oblong or oval fleshy excrescences something similar in appearance to the thickened base of the stem. These *calli* are in an early stage minutely papillate, especially towards the outer edge (fig. 6), but as they advance in age the papillæ elongate into irregularly branched, cellular, cylindrical filaments (fig. 5, 9, 10). On cutting open the *callus* innumerable minute granules, resembling those which constitute the solid part of the endochrome of the cells, issue forth, but these bear no resemblance to spores of any description. The substance of the frond is thicker, and the reticulations, shown at fig. 4, larger than in *N. Bonnemaisoni*, to which species the present is nearly allied. The colour when fresh is a rosy-red, but the slightest contact with fresh water changes this to a golden-orange. On drying, however, the original colour is restored, and is retained in the herbarium. The substance is softer than in *N. Gmelini*, and in drying the plant adheres more firmly to paper.

I have little to add to the account of this species already pub-



lished in the Manual, except it be to record the discovery, by Miss Ball in the south of Ireland, of remarkably luxuriant specimens, from one of which the uppermost figure in our plate has been drawn. Miss Ball's first specimens were gathered in 1834, and she obtained further supplies in 1840 and 1844:—but as all these, like the Devonshire plants, were washed on shore, the *habitat* of the species remains unknown.

By a recent communication from Mrs. Griffiths I learn that it was Miss Hill, and not Mrs. Hare, who was the original discoverer of this species in 1800; but it appears to have been known to the latter lady shortly afterwards, and called by her *Fucus Halensis*. To Mrs. Griffiths it has been familiar for thirty years under the colloquial name “*Orange Dwarf*,” which at once expresses its usually small size, as compared with others of the genus, and the rapid change of colour which it undergoes on touching fresh water. The last peculiarity is so striking that a passing shower of rain has often betrayed it to Mrs. Griffiths, when before the shower it had passed unnoticed among other red plants.

Dr. Greville in his ‘*Cryptogamic Flora*’ considers it identical with *N. Bonnemaisoni*, an opinion which he subsequently abandoned; and in his *Algæ Britannicæ* he refers it to *N. Gmelini*. I agree with Mrs. Griffiths in judging it to be distinct from both these species, at the same time admitting that it borders very closely on both, and that in the absence of a knowledge of its fructification it is difficult to fix on a very tangible distinguishing character. I have endeavoured, in the accompanying plate, to detail all its known characters. Among these it is impossible to overlook the anomalous, but very constant, production of *calli*, giving birth to branching filaments, totally unlike the usual form of proliferous growth; as certainly not parasitical; neither, so far as we know, having relation to fructification. And yet it must be confessed that they bear a near resemblance to the fructiferous processes of the singular Australian genus *Heterocladia* of Decaisne. It would be a highly curious and interesting discovery should *tetraspores* ever be found on these processes in the present species.

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Fig. 1, 2, 3. NITOPHYLLUM VERSICOLOR, different varieties:—*natural size*. 4. Portion of the frond, to show the structure. 5, 6. Apices, producing calli. 7. Section of a callus. 8. Granules filling its cavity. 9, 10. Ciliæ of the callus:—*all more or less magnified*.

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## PLATE X.

POLYSIPHONIA RICHARDSONI, *Hook.*

GEN. CHAR. *Fronde* filamentous, partially or generally articulate; joints longitudinally striate, composed internally of parallel tubes or elongated cellules. *Fructification* two-fold, on distinct plants; 1, ovate capsules (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped seeds; 2, *tetraspores* imbedded in swollen branchlets. POLYSIPHONIA—from *πολύς*, *many*, and *σίφων*, a *tube*; because the axis of the frond is composed of many tubes.

POLYSIPHONIA *Richardsoni*; stems cartilaginous, setaceous; branches alternate, elongated, divaricate, beset in the upper part with very patent, straight, sub-dichotomous ramuli; articulations of the stem and branches two or three times longer than broad, irregularly veined; of the ramuli shorter; capsules sessile, globose.

POLYSIPHONIA *Richardsoni*, *Hook. Br. Fl.* vol. ii. p. 33. *Harv. Man.* p. 90.

HAB. Very rare. At Colvend, Dumfries, *Dr. John Richardson*.

GEOGR. DISTR. South-west of Scotland.

DESC. *Root* scutate. *Fronde* 3–4 inches long, setaceous, rather rigid, with a subdistinct, zig-zag stem, very much branched from a short distance above the base; the branches issuing at right angles, angularly bent, as long as the main stem, subquadrifarious, mostly alternate, beset with distant, very patent, subdichotomous, straight branchlets, which bear a few mostly simple, erecto-patent or erect, subulate ramuli. *Articulations* visible in the main stem, subtorulose, the lower ones three or four times longer than broad, spirally or irregularly tubed; the upper shorter, with parallel tubes. Capsules globose, sessile, wide-mouthed, situate near the summits of the lesser branches. Tubes about five in the stem, each with a deep-coloured bag of endochrome.

What little is known of this species, if it be entitled to that rank, is taken from a specimen gathered by Dr. Richardson many years ago, before the Arctic Expedition which he accompanied, and preserved in Sir W. J. Hooker's rich Herbarium. Our uppermost figure is nearly a fac-simile of that specimen.

Though it closely borders in its microscopic characters on several species, its habit does not precisely agree with any with which I am acquainted. The nearest in affinity is perhaps *P. fibrillosa*, and it is possible that it may be only an anomalous



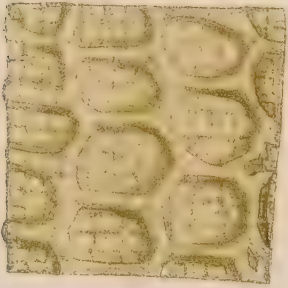
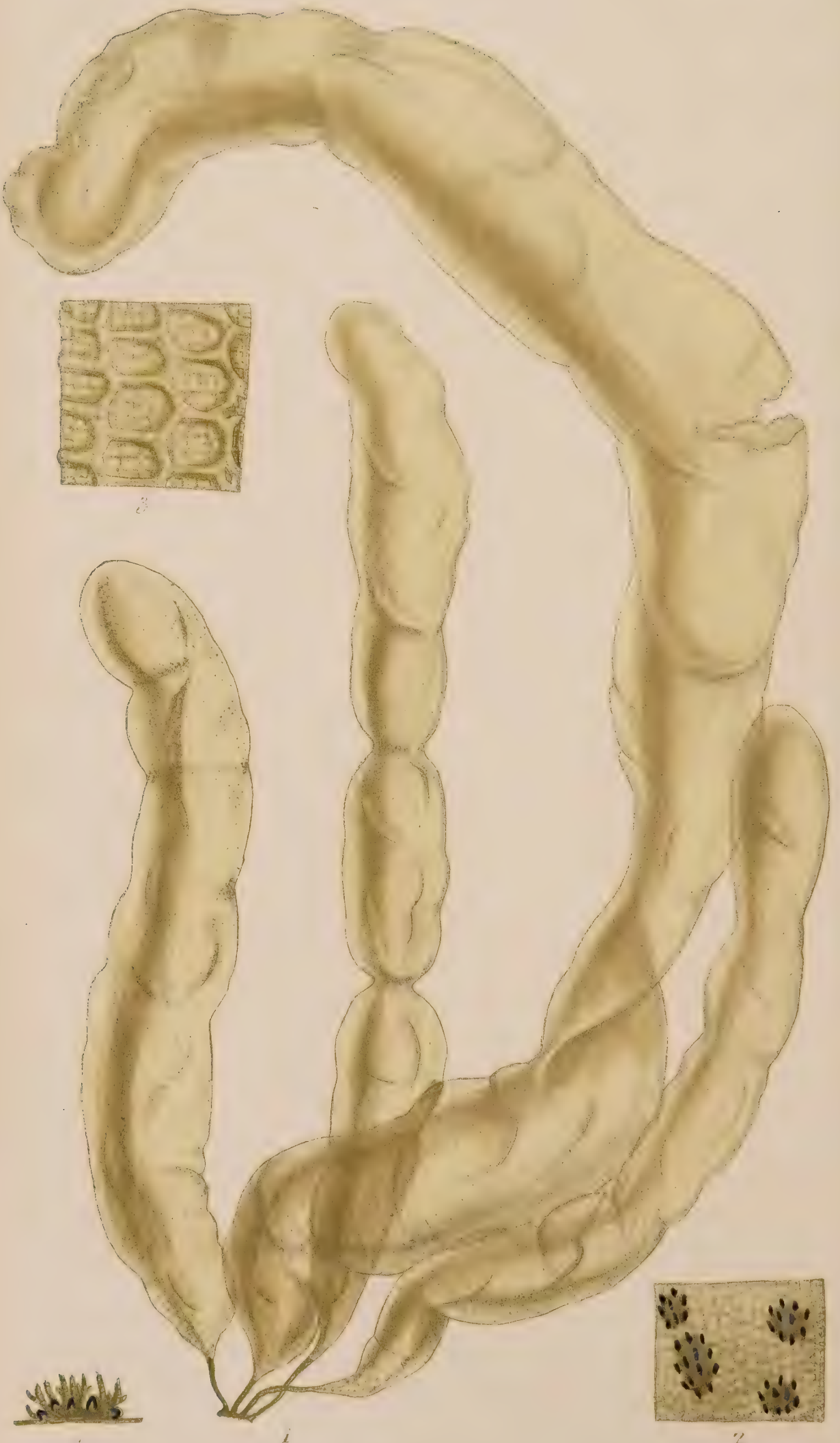
form of that very variable species, from the normal state of which its clearly articulate stem affords a ready distinctive character. The habit of branching strikingly reminds us of *P. elongella*, but in no other character does it agree with that species. There is also an affinity with *P. violacea* and *P. fibrata*, and especially with *P. Griffithsiana*; but from all these it differs in more or less degree, and with none, except the last, has it a very strong relation. With the view of attracting the attention of collectors to the subject, and thereby clearing up the doubts which I cannot help entertaining respecting the validity of the species, I have given it an early figure. Nothing is known respecting the manner or place of its growth, but very probably it is a parasite on some of the smaller Algæ; and most likely an annual, and found in the summer season.

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Fig. 1. POLYSIPHONIA RICHARDSONI :—*natural size*. 2. Apex of a branch :—*magnified*. 3. Portion of the stem. 4. Portion of an upper branch. 5. Transverse section of the stem. 6. Capsule or *ceramidium* :—*all more or less magnified*.

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3



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1



## PLATE XI.

## ASPEROCOCCUS TURNERI, Hook.

GEN. CHAR. *Frond* unbranched, tubular, cylindrical or rarely compressed, inflated, continuous, membranaceous. *Root* naked, scutate. *Fructification* scattered over the whole frond, in minute, distinct dots, composed of roundish, prominent seeds, intermixed with club-shaped filaments. ASPEROCOCCUS—corruptly formed from *asper*, *rough*, and *κόκκος*, a seed; because the dots of seeds are mixed with bristle-like filaments.

ASPEROCOCCUS *Turneri*; frond inflated, cylindrical, obtuse, oblong or club-shaped, suddenly contracted at the base into a short stem, thin and membranaceous; dots of fructification minute, roundish.

ASPEROCOCCUS *Turneri*, Hook. *Br. Fl.* vol. ii. p. 277. *Wyatt. Alg. Danm.* no. 59. *Harv. in Mack. Fl. Hib.* part 3. p. 175. *Harv. Man.* p. 34.

ASPEROCOCCUS *bullosus*, Lamour. *Ess.* p. 62. t. 6. f. 5. *Grev. Alg. Brit.* p. 51. *Endl. 3rd Suppl.* p. 26. *J. Ag. Alg. Medit.* p. 41. *Menegh. Alg. Ital. et Dalm.* p. 166.

ASPEROCOCCUS *rugosus*,  $\beta$  *bullosus*, Dub. *Bot. Gall.* vol. ii. p. 956.

ENCÆLIUM *bullosum*, Ag. *Sp. Alg.* vol. i. p. 146. *Syst.* p. 262. *Spreng. Syst. Veg.* vol. iv. p. 328. *Kütz. Phyc. Gen.* p. 326. t. 21. f. 1.

GASTRIDIDIUM *opuntia*, Lyngb. *Hyd. Dan.* p. 71. t. 18.

ULVA *Turneri*, Dillw. —. *Eng. Bot.* t. 2570.

HAB. In the sea, on stones and the larger Algæ, on *Zostera*, &c., often growing in 4–5 fathoms. Annual. Summer and Autumn. Coast of Sussex, Mr. Borrer. Devonshire, Mrs. Griffiths. Bantry Bay, Miss Hutchins. Appin, Capt. Carmichael. The “Murrough” at Wicklow, W. H. H. (1833). Strangford Lough and Clew Bay, Mayo, Mr. W. Thompson. Roundstone Bay, Galway, Messrs. W. Thompson, R. Ball, and E. Forbes (1840). Howth, Miss Ball. Ireland’s Eye and Lambay, Mr. R. Ball. Abundant on the Kerry Coast, Mr. W. Andrews. Dingle and Valentia, W. H. H. Jersey, Miss White.

GEOGR. DISTR. Atlantic coast of Europe, from Norway (Lyngb.) to Spain. Baltic Sea. Mediterranean and Adriatic Seas. Southern Ocean, Agardh.

DESC. *Root* a minute scutate disc. *Fronds* commonly from 6 to 12 inches in length, and from half an inch to an inch and a half in diameter, but occasionally 16 to 42 inches in length and from 2 to 4 in diameter, suddenly contracted at the base into a thread-like stem, which varies from  $\frac{1}{4}$  to  $\frac{1}{2}$  an inch in length, inflated, bag-like, and of nearly equal breadth throughout, sometimes club-shaped, very obtuse, here and there occasionally contracted, delicately membranaceous and subtransparent, pale olive or inclining to fawn colour. When young the frond is greenish olive with a soft and subgelatinous feel and adheres to paper, but older specimens are harsher, of rather thicker substance, and will not adhere to paper in drying. Dots of *fructification* very minute, roundish or oblong, sometimes confluent, densely scattered over the surface, composed of dark-coloured, elliptical spores lying on the surface of the frond, among which, in greater or less

abundance, spring short, simple, or slightly branched, jointed filaments. The structure of the membrane, as shown at fig. 3, is very beautiful. The outer surface of the frond is composed of slightly inequilateral, 4- or 5-sided cells with thick walls, and containing a granular, pale-olive endochrome. These are internally strengthened by a lattice-work which lines the whole frond, whose meshes are 12-16 times as large as the cells of the membrane.

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We are not informed by whom this species was first observed. The honour rests between Miss Hutchins and Mr. Borrer, by each of whom it was found in different localities early in the present century, and named, by Dillwyn, in honour of Mr. Dawson Turner, the distinguished author of the '*Historia Fucorum.*' Unfortunately Mr. Dillwyn delayed for several years the publication of the species, and it first appeared under this name in the volume of English Botany for 1813; in which same year, Lamouroux, unaware of the long-conferred manuscript name, published it as a new species, conferring upon it the specific name *bullosus*, by which it is still universally known on the continent. It is a question which specific name has the priority in *publication*, and in an ordinary case I should feel bound to follow the majority—who have decided in favour of *bullosus*,—but I am unwilling, without better grounds, to deprive the Father of modern Phycology of a well-merited compliment; and I therefore follow Hooker in retaining the specific name earliest proposed—though not published.

*Asperococcus Turneri* appears to delight in land-locked muddy bays, where it grows to the gigantic size mentioned in the description. Specimens upwards of three feet in length, have been dredged by Mr. Thompson in Strangford Lough. I have seen individuals not much inferior in the little harbour of Dingle, and in the long, deep channel which divides Valentia from the mainland. When growing in deep water its favourite habitat is on the stems and leaves of *Zostera*. Specimens gathered within the tide range are of much smaller size, not more than a few inches in length. Except in size it is subject to little variation. It may always be known from *A. echinatus* by its greater delicacy of texture, more evident reticulations, paler colour, and more obtuse and inflated frond.

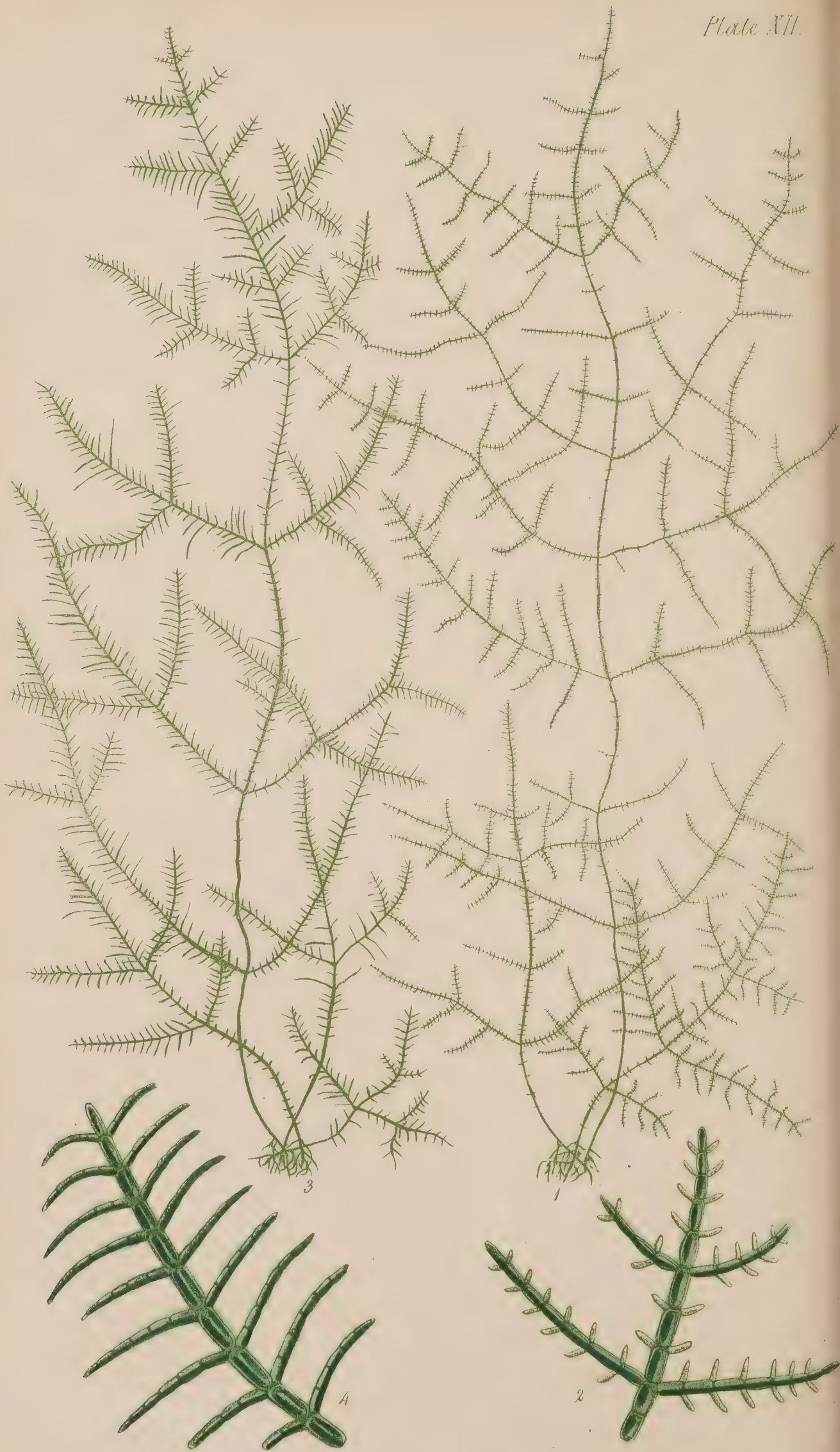
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Fig. 1. ASPEROCOCCUS TURNERI. 2. Small section *magnified*, showing the spots of fructification, vertical view. 3. Fragment more *highly magnified*, to shew the internal net-work. 4. One of the spots of fruit, viewed laterally.

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## PLATE XII.

CLADOPHORA RECTANGULARIS, *Griff.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some periods, a proper, ciliary motion. CLADOPHORA—from κλάδος, a branch, and φέρω, to bear; a branching plant.

CLADOPHORA *rectangularis*; filaments setaceous, rigid, forming intricate tufts; branches opposite, distant, elongated, patent, furnished throughout with short, opposite, horizontal ramuli; articulations twice or thrice as long as broad.

CONFERVA *rectangularis*, *Griff. MSS.* *Harv. in Hook. Br. Fl.* vol. ii. *Addenda*, p. 10. *Wyatt, Alg. Danm.* no. 145. *Harv. Man.* p. 135.

CONFERVA *Crouani*, *Chauv. MSS. sec. Berk. in Litt.*

HAB. In the sea, at depths beyond the influence of the tides. Annual. Summer. Torquay, cast on shore, very rare; *Mr. Borrer* and *Mrs. Griffiths*. Galway, *Mr. Reilly*. Dredged in Roundstone Bay, county of Galway, in 4–6 fathoms, very abundant, *Mr. W. M'Calla*. Abundant at Great Arran, Galway Bay, *Mr. Andrews*.

GEOGR. DISTR. South of England, very rare. Abundant in certain districts of west of Ireland, but very local. Coast of Normandy.

DESC. *Filaments* as thick as horse-hair, 8–12 inches long, forming tufts which are often much entangled together, divided irregularly into three or four principal branches, or with an undivided stem. *Branches* very patent, issuing nearly at right angles, distant, opposite, or by abortion occasionally alternate, simple, or furnished with a second series of lesser branches which are equally patent and opposite, rarely naked, mostly furnished throughout their length with short, opposite, horizontal, simple, jointed ramuli, which issue either from every joint of the branches and stem, or at every third or fourth joint. These are occasionally ternate or quaternate. The ramuli vary considerably in relative length in different specimens, being in some individuals (as in fig. 1) not half a line in length, in others (fig. 3) 3–5 lines; and, in a specimen now before me, from half an inch to an inch. In this last case the long ramuli are comparatively few, and mixed with others of the usual length. *Colour*, a full, bright green, fading in the herbarium. Substance when quite fresh, crisp and rather rigid, soon becoming flaccid, but never adhering strongly to paper. Articulations of uniform length throughout the plant, twice or thrice as long as broad; joints slightly contracted.

A beautiful species, discovered in the year 1832 by Mr. Borrer, washed up on the beach at Torquay, and occasionally found, but very rarely, in the same locality by Mrs. Griffiths and Mrs. Wyatt. Of the date of its discovery in Normandy I am not informed,



but have reason to believe it subsequent to the publication of the English station. Mr. Mc'Calla was the first to detect it on the Irish coast, in the year 1840, and to him we owe the knowledge of its occurrence in plenty in Roundstone Bay, county of Galway. He describes it as covering the bottom of the bay in wide spreading strata, at a considerable depth for an individual of this genus, and as being, towards the close of the summer, washed up in very large quantity, so as to be carted off by the country people for manure. This will sound strangely in the ear of an English botanist accustomed to save the minutest scrap as a prize, or to spend hours in the disentangling of a specimen rolled together by the waves; but Mr. Mc'Calla's statement is confirmed by our friend Mr. Andrews, who observed it cast up in similar abundance at Arran.

No species can be more distinct. The very patent, opposite branches, and the invariably opposite, distichous, horizontal ramuli are its peculiar characteristics. It is most nearly related to *C. Hutchinsiae* and *C. diffusa*, of which it has the size, rigidity, and something of the habit. But the opposite ramuli clearly separate it from either. Both the varieties represented in our plate are from Roundstone Bay.

I cannot find that it has been noticed in any continental work. The name, given by Chauvin, under which it was received from M. Lenormand by Mr. Berkeley, does not appear to have been published, and this is the only continental authority which I have been able to ascertain for the species.

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Fig. 1, CLADOPHORA RECTANGULARIS, var.  $\alpha$  :—*natural size*. 2. Portion of the same :—*magnified*. 3. Var.  $\beta$  :—*natural size*. 4. Portion of the same :—*magnified*.

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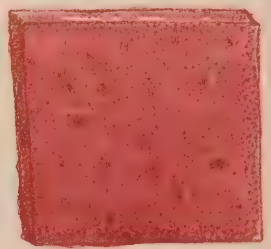




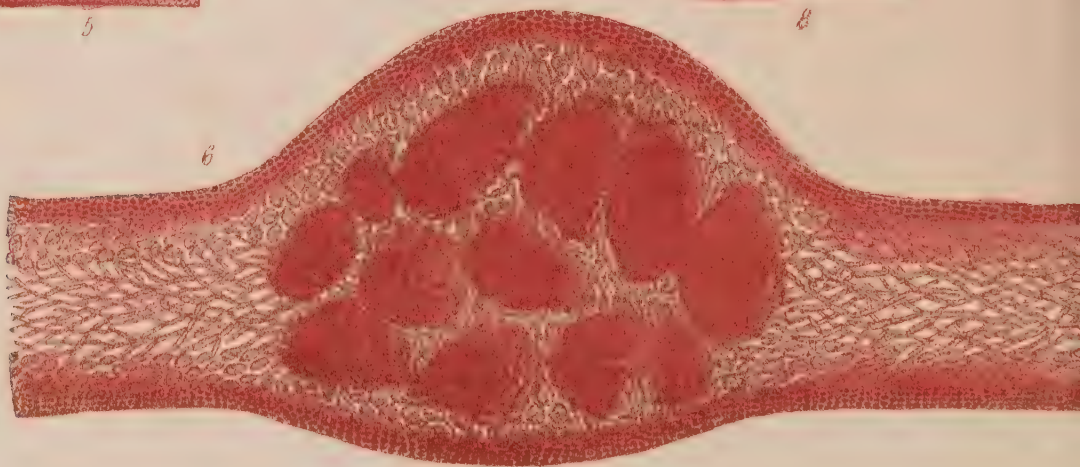
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## PLATE XIII.

KALYMENIA RENIFORMIS, *J. Ag.*

GEN. CHAR. *Fron*d blood-red, ribless, expanded, carnosomembranaceous, formed internally of three strata; the *inner*, of interlacing filaments; the *medial*, of large, roundish cells; the *outer*, of minute, vertically disposed cellules. *Fructification* two-fold, on distinct plants: 1, spherical masses of spores (*favellidia*) semi-immersed in the frond; 2, triangularly divided, scattered *tetraspores*. KALYMENIA—from *καλος*, *beautiful*, and *ὑμῆν*, a *membrane*.

KALYMENIA *reniformis*; stem short, cylindrical, suddenly expanding into a roundish, subsimple or irregularly cleft, somewhat lobed frond; favellidia densely scattered over the surface.

KALYMENIA *reniformis*, *I. Ag. Alg. Medit.* p. 99. *Endl. 3rd Supp.* p. 40. (*Excl. Syn. Post. and Rupp.*)

IRIDÆA *reniformis*, *Bory, Dict. Class.* vol. ix. p. 16. *Grev. Alg. Brit.* p. 160.

HALYMENIA *reniformis*, *Ag. Sp.* vol. i. p. 201. *Syst.* p. 241. *Spr. Syst. Veg.* vol. iv. p. 333. *Gaill. Dict. Sc. Nat.* 53. p. 361.

RHODOMENIA *reniformis*, *Hook. Br. Fl.* vol. ii. p. 292. *Wyatt, Alg. Damn.* no. 19. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Manual*, p. 64.

EUHYMENIA *reniformis*, *Kütz. Phyc. Gen.* p. 400.

SARCOPHYLLIS *lobata*? *Kütz. l. c.* p. 401. t. 76. f. 3.

FUCUS *reniformis*, *Turn. Hist. Fuc.* t. 113. *E. Bot.* t. 2116.

HAB. In deep shady pools, at extreme low water mark, rare. Often washed on shore from deeper water. Perennial? Summer and Autumn. Niton, *Miss Everett*. Devonshire, *Mrs. Griffiths* and *Miss Hill*. Cornwall, *Mr. Rashleigh*; *Mr. Ralfs*. Bantry Bay, *Miss Hutchins*. Malbay, *W. H. H.* Antrim, *Mr. Moore*. Coast of Down, *Miss Davison*; *Mr. W. Thompson*. Orkney, *Rev. Mr. Pollexfen*. Kerry, *Mr. Andrews*. Scilly Islands and Jersey, *Miss White*.

GEOGR. DISTR. Shores of the British Islands. Atlantic shores of France (and Spain?) Mediterranean Sea? (*Ag.*)

DESCR. *Root* scutate. *Stem*  $\frac{1}{4}$  to  $\frac{1}{2}$  inch long, cylindrical or compressed, suddenly expanding into a roundish, elliptical or reniform frond of a soft, thickish-membranaceous substance, and blood-red colour, simple, or producing at the margin secondary fronds resembling the primary one in form and substance. These vary in breadth from an inch to 6–8 or even 14 inches, but rarely sport much in form, except when continuing to grow after they have been torn by the waves. *Favellidia* the size of poppy seed, densely scattered over the frond to which they give a peculiarly gritty feel, semi-immersed, containing several clusters of dark-red, oblong, somewhat angular seeds, densely packed together. *Tetraspores* extremely minute, scattered among the surface cellules. The structure, as shown at fig. 6, consists of three strata; the *inner*, composed of branched and anastomosing

jointed filaments, formed of long, cylindrical cells; the *medial*, of long, irregularly disposed, elliptical cells; the *outer*, of minute, vertically placed, dark-red cellules, forming simple filaments whose tips constitute the minute surface cells seen when the frond is viewed under the microscope.

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*Kalymenia reniformis*, first described in the '*Historia Fucorum*,' was discovered by Miss Everett, early in the present century, on the shores of the Isle of Wight, and long regarded as an extremely rare species. Of late years many new habitats have been ascertained for it, and it is now, at least in Ireland, known to be far from uncommon. In Scotland it appears to be more rare, and yet it occurs as far north as Orkney. At Falmouth, Miss Warren finds specimens without fruit, which differ from the usual state of the species in being of a more oblong form, and much more tapering at the base. These may possibly belong to a new, but nearly allied species, and I therefore abstain from noting them further at present.

I have ventured to quote *Sarcophyllis lobata*, Kütz., founded by that author on a specimen gathered at Sidmouth, and existing in the herbarium of Senator Binder of Hamburgh, under the present species, but how far I am correct in so doing cannot be determined without consulting the original specimen.

*Fucus acetabulum*, Gouan, quoted by Agardh as a synonyme of his *Halymenia reniformis*, and which, so far as I know, is the only authority for his Mediterranean habitat, is, as I have ascertained by an original specimen in Herb. Hooker, a totally different plant; namely, *Constantinea reniformis*, Post. and Rupp. (*Crytonemia*? *Forbesii*, Harv. in Hook. Ic. t. 679; *Neurocaulon foliosum*, Zanard.). Endlicher, misled by Agardh, confounds these species, and consequently, but most incorrectly, reduces the well-distinguished genus CONSTANTINEA (founded on *Fucus rosa-marina*, Gm.) under *Kalymenia*.

The Cape of Good Hope specimens, mentioned in the Manual, are regarded by Professor J. Agardh as belonging to a distinct species, named by him *K. Harveyana*.

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Fig. 1 and 4. *KALYMENIA RENIFORMIS*, with tetrasporic fruit. 2 and 3, with favellidia:—*natural size*. 5, Portion of the frond, with a cluster of favellidia. 6. Section showing the structure of the frond, and of a favellidium. 7. Spores. 8. Portion of the frond with tetraspores. 9. Tetraspores:—all more or less *magnified*.

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## PLATE XIV.

## CARPOMITRA CABRERÆ, Kütz.

GEN. CHAR. *Fron*d linear, dichotomous, flat and mid-ribbed (or filiform), olivaceous. *Fructification*, mitriform receptacles terminating the branches, composed of horizontal branching filaments whorled round a vertical axis and producing elliptic-oblong seeds. CARPOMITRA— from καρπός, *fruit*, and μίτρα, a *cap* or *mitre*; mitre-fruit.

CARPOMITRA *Cabrera*; frond irregularly dichotomous, linear, narrow, flat, mid-ribbed; branches here and there constricted.

CARPOMITRA *Cabrera*, Kütz. *Phyc. Gen.* p. 343.

SPOROCHNUS *Cabrera*, *Ag. Sp. Alg.* vol. i. p. 156. *Syst.* p. 260. *Grev. Syn.* p. xl. *Harv. in Mack. Fl. Hib.* part 3rd. p. 154. *Man.* p. 28. *Endl. 3rd Suppl.* p. 28.

FUCUS *Cabrera*, *Clemente Ess.* p. 313. *Turn. Hist. Fuc.* t. 140.

HAB. Extremely rare. Beach at Youghal, 1833, *Miss Ball*.

GEOGR. DISTR. Cadiz, *Clemente*. South of Ireland.

DESC. *Root* a shapeless tuber. *Stems* 6–8 inches high, much branched in an irregularly dichotomous manner, flat, more or less distinctly mid-ribbed, coriaceous-membranaceous. *Branches* erect, with acute axils, distichous, alternate, narrow below, becoming rather broader upwards, here and there constricted, the apices truncate and often discoloured. *Colour* a light brown. The *frond* consists of two strata; the inner composed of large, colourless, polygonal cells, through which the immersed mid-rib runs; the outer, together with the mid-rib, of very minute coloured cells in a single layer. *Fruit* formed upon the thickened apex of the mid-ribs of the branches, mitriform, minutely capitate, having a central, densely cellular, cylindrical axis round which branching, horizontal articulated filaments are whorled. The lower joints of these filaments are slender, the upper beaded, and the terminal joint—which contains minute bodies, probably the remains of spermatozoa—oblatelly elliptical. *Spores* pedicellate, linear elliptical, borne toward the base of the whorled filaments.

The phanerogamous Flora of Ireland includes so many plants, natives of Spain and Portugal, that it ought not to excite surprise when a Spanish sea-weed occurs on our coasts. And yet, specimens of *C. Cabrera* having never been found but once, and then only washed on shore, we may be allowed to entertain the fear that this interesting plant is not truly the growth of our shores, but wafted hither, as extra-European productions sometimes are, by the force of currents. Even should this be so, it is



well to record the circumstance by a figure representing one of the specimens picked up on the Irish coast, for which, among many others, the University Herbarium is indebted to the liberality of Miss Ball, a lady who has done much to illustrate the Irish Cryptogamic Flora. The present plant is in many respects the most interesting of her discoveries, should it eventually be established as a British species. Even on the continent, as far as we know, it is an extremely local and rare species, and is the only member of the genus to which it belongs which occurs in a northern latitude.

The name *Carpomitra* is proposed by Kützinger for those species of the Agardhian genus *Sporochnus* which have *terminal, sessile fruit*, namely *C. Cabrerae* and *C. inermis*. With the latter species I am unacquainted, except by Turner's figure, and am not quite sure that it is a congener; but another species (*C. Haliseris*, Harv.) recently described by Dr. Hooker and myself, is closely related to *C. Cabrerae*, from which it chiefly differs in having a frond nearly as wide and as distinctly ribbed as *Haliseris poly-podioides*. It is a native of New Zealand. We thus have a new instance, interesting because occurring in so limited and peculiar a genus, of analogous forms inhabiting similar climates of the northern and southern hemisphere.

*C. Cabrerae* was first described by Clemente in his list of Spanish Algæ, published 1804, being named by him "in honour of one of his fellow-labourers in the investigation of the botany of Spain, Don Antonia Cabrera, Canon of the Church of Cadiz, and it must be allowed," continues Mr. Turner, "that he has chosen for his friend a curious plant."—There is no British Alga with which the student can well confound it. Some very narrow varieties of *Dictyota dichotoma* faintly resemble it, but it requires a very slight examination to distinguish it from them.

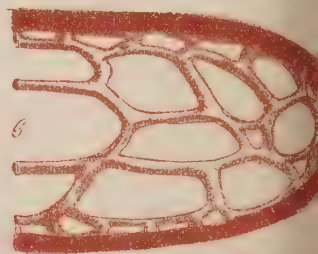
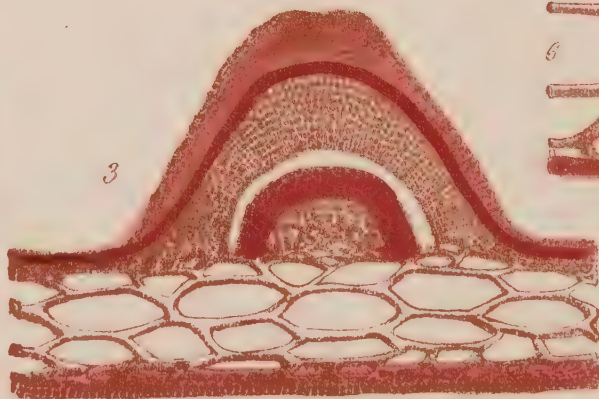
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Fig. 1. *CARPOMITRA CABRERÆ*:—*natural size*. 2. Part of a branch, showing the barren and fertile apices. 3. View of the surface of the frond. 4. Transverse section of a branch. 5. Receptacle of fruit. 6. Transverse section of the same. 7. Verticillate filaments, and spores from the same:—*all magnified*.

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## PLATE XV.

GRACILARIA MULTIPARTITA, *J. Ag.*

GEN. CHAR. *Fronde* filiform or rarely flat, carnosio-cartilaginous, continuous, cellular; the central cells very large, empty or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds, on distinct individuals; 1, convex tubercles (*coccidia*), having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores*, zoned or tripartite, imbedded in the cells of the surface. GRACILARIA (*Grev.*),—from *gracilis*, slender.

GRACILARIA *multipartita*; frond flat, tender, semi-transparent, brittle, dull purplish red, deeply cleft in an irregularly dichotomous or palmate manner; the branches linear-wedge-shaped, apices acute, tubercles conical, very prominent, scattered over the segments.

GRACILARIA *multipartita*, *J. Ag. Alg. Medit.* p. 151.

GRACILARIA *polycarpa*, *J. Ag. l. c.* p. 151.

PLOCARIA *multipartita*, *Endl. 3rd Suppl.* p. 51.

PLOCARIA *polycarpa*, *Endl. l. c.* p. 51.

CHONDRUS *multipartitus*, *Grev. Syn.* p. lvi. *Harv. in Hook. Journ. Bot.* vol. i. p. 155.

SPHÆROCOCCLUS *multipartitus*, *Ag. Sp. Alg.* vol. i. p. 247. *Ag. Syst.* p. 212.

SPHÆROCOCCLUS *polycarpus*, *Grev. Sc. Cryp. Fl.* t. 352.

RHODOMENIA *polycarpa*, *Grev. Alg. Brit.* p. 87. *Hook. Br. Fl.* vol. ii. p. 289. *Harv. Man.* p. 61. *Wyatt, Alg. Danm.* no. 108.

FUCUS *multipartitus*, *Clem. Hist.* p. 311.

FUCUS *granatus*, *Turn. Hist.* t. 215 (*excl. syn. Lamx.*).

FUCUS *æruginosus*, *Turn. Hist.* t. 147.

HAB. On rocks and stones in the sea, in muddy places, chiefly estuaries; near low-water mark, and at a greater depth. Very rare. Annual. August and September. Shore under Tait's Hill, Plymouth, *Miss Hill* (1802); *Mr. R. Sconce*. Plymouth Sound, abundantly, *Rev. W. S. Hore*, *Mr. J. W. Rohloff*, *Dr. Cocks*. Whitsand Bay, *Dr. Jacob*. Dredged in Salcombe Bay, *Mrs. Wyatt*.

GEOGR. DISTR. Shores of Europe from the south of England to Spain. East coast of North America, from New York to Florida. California. West Indies (*Miss Dix*). Pernambuco, *Areschoug*. Red Sea, *Lord Valentia*. Mauritius, *Mrs. Telfair*.

DESCR. *Root*, a thin spreading disk. *Fronde* four to twelve inches long, flat, cleft nearly to the base in an irregularly dichotomous manner; sometimes vaguely divided, or palmate; sometimes having the lesser segments secund, and often margined with horizontal laciniae. The breadth of the frond varies from half a line to more than half an inch; the thickness is commonly nearly the tenth of an inch. When freshly gathered it is "thick, cartilaginous, tender, semitransparent, and very brittle"; but when dry, it becomes tough and shrinks considerably. The *tubercles* are large, conical, depressed at the apex, very prominent and abundantly dispersed over the frond. They contain, under a thick pericarp composed of vertical, densely

packed filaments, a roundish mass of minute spores spread upon a hemispherical central placenta. The *tetraspores* are scattered over the whole surface of the plant which produces them, and are mostly triangularly divided. *Colour* a dull purple, becoming greenish on exposure.

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I am indebted to M. Lenormand for having pointed out to me the identity between the *Rhodomenia polycarpa* of Greville, and the older *Fucus multipartitus* of Clemente, which Greville includes in his genus *Chondrus*; and also for a suite of beautifully preserved specimens, showing the changes which this most variable plant assumes, according to the circumstances under which it grows; and I have had the additional advantage of consulting, in the Herbarium of Mrs. Griffiths, an authentic specimen of *Fucus multipartitus*, from Cadiz, which is in all respects similar to some of our British individuals. Prof. J. Agardh, while he transfers the *Rhod. polycarpa* and *Chondrus multipartitus* of Greville to the reformed genus *Gracilaria*, retains both species. With respect to the *Fucus æruginosus* of Turner, which I had been in the habit of regarding as the typical state of *G. multipartita*, and which I had hitherto looked upon as truly distinct from our British *R. polycarpa*: a more careful examination and a comparison of multitudes of specimens from very distant parts of the world, induce me now to regard this as merely a variety originating probably from the plant's growing in rougher water, beyond the influence of the estuaries; and consequently acquiring a firmer texture, and narrower segments: the marginal processes are common to all the varieties. A still more remarkable form of this species is Agardh's var. *δ. angustissimus*, of which specimens have been kindly sent to me by Prof. J. W. Bailey, of New York, who obtained them at Providence, Rhode Island, where vast quantities of this variety grow on sandy bottoms. These specimens are quite as slender as *Gracilaria confervoides*, and nearly cylindrical, excessively divided, and forming bushy tufts. But that the very narrow ones are mixed with others, which show a decided return to the common form of the species, one would never suspect them to belong to it; yet some are covered with the characteristically abundant tubercles. Mr. Hore has found at Plymouth, as Mrs. Griffiths informs me, specimens almost equally narrow.

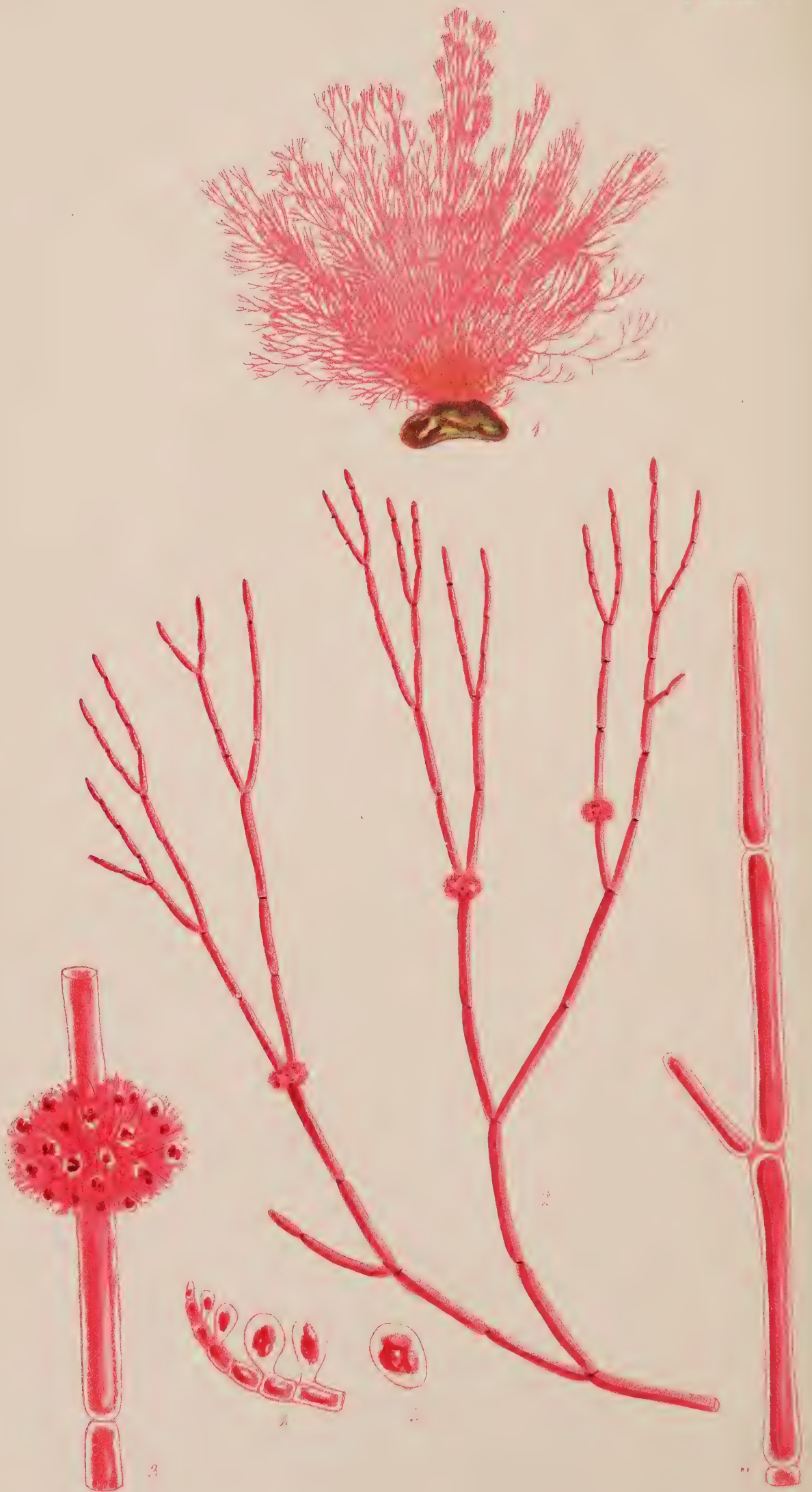
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Fig. 1. GRACILARIA MULTIPARTITA:—*natural size*. 2. A portion, showing the pitted appearance of the surface:—*slightly magnified*. 3. Section of frond and tubercle, to show the structure of both. 4. Spores from the tubercle. 5. Tetraspores. 6. Section of a thicker portion of the frond:—*all highly magnified*.

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## PLATE XVI.

GRIFFITHSIA DEVONIENSIS, *Harv. (n.sp.)*

GEN. CHAR. *Fronde* rose-red, filamentous; *filaments* jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* affixed to whorled involucreal ramuli; 2, gelatinous *receptacles* (*favellæ*), surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA—so named by Agardh, in honour of Mrs. Griffiths of Torquay, the most distinguished of British Algologists.

GRIFFITHSIA *Devoniensis*; filaments very slender, gelatinous, flaccid, dichotomous, the lower axils patent, the upper acute; articulations cylindrical, 7–8 times as long as broad; joints constricted; involucre whorled round the joints of the branches.

HAB. Muddy sea-shores, in deep water: rare. Plymouth, *Rev. W. S. Hore* (July 1840). At Salcombe, *Mrs. Wyatt* (Sep. 1840).

GEOGR. DISTR. South of England.

DESCR. *Filaments* 2–3 inches high, tufted, very slender, dichotomously divided, fastigate, the lower axils very patent, the upper acute; branches mostly naked, but sometimes throwing out short, root-like, lateral branchlets. *Substance* soft and gelatinous, closely adhering to paper, and having a gloss when dry. *Articulations* many times longer than broad, cylindrical, slightly incrassated at each end; the joints constricted. *Tetraspores* affixed to the inner face of short involucreal ramuli which are densely whorled round the main filaments, at the apex of an articulation, where they form roundish masses. *Favellæ* unknown. *Colour* rose-red, soon discharged in fresh-water.

This graceful little plant, which appears different from all the species of *Griffithsia* yet described, was discovered in the summer of 1840, by the Rev. Mr. Hore, at Plymouth; and, in the autumn of the same year, added to the flora of Devonshire by Mrs. Wyatt. I record this latter habitat in the specific name because it affords me an opportunity, of which I gladly avail myself, to connect the name of Mrs. Griffiths with that of the county whose shores she has so long and so successfully explored, where the best part of her life has been spent, and the natural history of which, in all its varied branches, her researches have so greatly advanced.

*G. Devoniensis* obviously belongs to the section of the genus typified by *G. corallina*, from which species the smaller size, more



slender filaments, and cylindrical articulations sufficiently distinguish it. It agrees better in these respects with the rare *G. barbata*, but differs in its inflorescence, if I may venture to use that term to express the disposition of fruit.

The genus *Griffithsia*, proposed by Agardh, in 1824, has been universally adopted by botanists, and now includes nearly thirty species, scattered through the seas of all temperate climates, and reaching even to the troubled ocean of Cape Horn. One species is tropical; several of great beauty are found in the Mediterranean; and the shores of Australia, the Cape of Good Hope, and Western South America contribute others. All the species possess a common property, that of being exceedingly impatient of the contact of fresh water. To secure well-preserved specimens they should be brought home in salt water, and kept in it till they can be laid on paper. A short exposure to air is sufficient to decompose them, and fresh water causes the membrane of the cells to burst, and the colouring matter to be discharged with violence, as well described by Dr. Drummond in Loudon's Magazine of Natural History.

The genus is nearly allied to *Callithamnion*, and still more nearly to *Wrangelia*, from which latter it is chiefly distinguished by having the tetraspores involucreted.

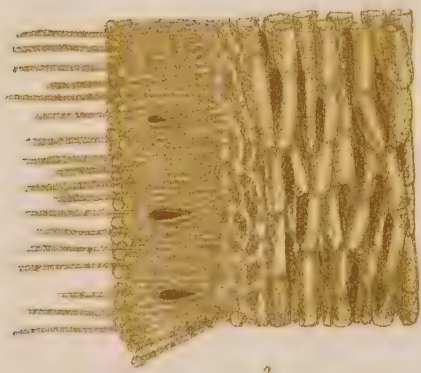
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Fig. 1. GRIFFITHSIA DEVONIENSIS :—*natural size*. 2. Upper portion of a filament. 3. Involucre. 4. Ramulus of ditto, shewing the position of the tetraspores. 5. A tetraspore. 6. Apex of a filament, to show the form of the articulations :—all *more or less magnified*.

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## PLATE XVII.

## CHORDARIA DIVARICATA, Ag.

GEN. CHAR. *Fron*d filiform, much branched, cartilaginous, solid. *Axis* composed of densely packed, longitudinal, interlaced, cylindrical filaments; the *periphery*, of simple, club-shaped, horizontal, whorled filaments, and long, byssoid, gelatinous fibres. *Fructification* obovate spores, seated among the filaments of the periphery. CHORDARIA—from *chorda*, a cord; because the branches resemble small cords.

CHORDARIA *divaricata*; frond irregularly divided; branches divaricate, subdichotomous, flexuous, furnished toward the apices with short, very patent, mostly forked ramuli; filaments of the periphery capitate.

CHORDARIA *divaricata*, Ag. *Syn.* p. 12. *Sp. Alg.* vol. i. p. 165. *Syst.* p. 256. *Endl.* 3rd *Suppl.* p. 23.

MESOGLOIA *divaricata*, Kütz. *Phyc. Gen.* p. 332.

HAB. Annual. Autumn. Thrown up from deep water, at Carrickfergus, near Belfast, Mr. Mc'Calla. Oct. 1845.

GEOGR. DISTR. Baltic Sea, Agardh. Belfast Lough.

DESCR. *Fron*d 1–3 feet long, not a line in diameter, forming globular tufts, the branches spreading in all directions from a centre; very irregularly divided. Some specimens are nearly dichotomous from the base, with distant forkings, four or five inches asunder, naked, or having a few short ramuli near the tips. Others have a short leading stem, furnished with very numerous, divaricating, lateral, secund or alternate branches, which are more or less regularly dichotomous, and beset with short, patent, forked ramuli. Others again, as our figure represents, have a much longer leading stem, giving birth to excessively numerous branches spreading at right angles, and furnished throughout with equally spreading lesser branches and ramuli. The surface of the whole frond is slimy, and clothed with long, byssoid, gelatinous fibres, which spread in all directions, and, when the plant is floating in the water, add greatly to its apparent diameter. These are imperfectly preserved in a dry state. *Colour* olive, much paler than in *C. flagelliformis*. The filaments composing the periphery are slender, scarcely clavate, the articulations, all but the terminal one, which is very large and globose, being nearly cylindrical. *Spores* affixed to the bases of the filaments of the periphery, obovate, bright olive, plentiful on our specimens.

*Chordaria divaricata* was first described by the elder Agardh in 1817, and until its recent discovery on the Irish coast was only known to inhabit the Baltic Sea, and even there was considered a rarity. Mr. Mc'Calla to whom we owe the Irish locality, found it thrown up in great plenty, last October, along the shores of



Belfast Lough, the habitat extending seemingly for miles. Baltic specimens, as described by Agardh, are only a few inches in length; and such are some that I owe to the kindness of Dr. Areschoug, of Gottenburg. Our Irish plants, on the contrary, are comparatively *giants*; the tufts being often two or three feet in diameter. I have been forced to select a small one for illustration, but the character of larger plants is very similar. In all respects, except luxuriance, the Irish and Baltic plants are identical.

The *branching* is sufficiently unlike that of *C. flagelliformis*, resembling much more closely that of *Stilophora rhizodes*, to which outwardly our plant bears a very great resemblance. But besides a difference in habit, it is well distinguished from *C. flagelliformis* by the shape of the filaments of the periphery which in that species are club-shaped, while in this they are slender, but terminated by a large globular cellule. In this respect there is a resemblance to a *Mesogloia*, but the structure of the axis is exactly that of *Chordaria*.

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Fig. 1. CHORDARIA DIVARICATA:—*natural size*. 2. Longitudinal section of the frond, showing part of the axis. 3. Transverse section of ditto. 4. Filaments of the periphery, and a spore. 5. Spores removed:—all *more or less magnified*.

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## PLATE XVIII.

CLADOPHORA GRACILIS, *Griff.*


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GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA—from *κλαδός*, a *branch*, and *φορέο*, to *bear*; a branching plant.

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CLADOPHORA *gracilis*; filaments very long, capillary, flexuous, silky, much branched, bright yellow green; main branches entangled, sparingly divided, angularly bent; ultimate ramuli pectinate, secund, much attenuated, straight and very long; articulations 3–5 times longer than broad.

CONFERVA *gracilis*, *Griff. in Wyatt. Alg. Danm.* n. 97. *Harv. in Mack. Fl. Hib.* part 3. p. 230. *Harv. Man.* p. 137.

HAB. Growing on *Zostera*, and the larger *Algæ*, in 4–5 fathoms. Annual. Summer. Torbay, *Mrs. Griffiths*. Youghal, *Miss Ball*. Belfast Bay, and Ballantræ, Ayrshire, *Mr. W. Thompson*.

GEOGR. DISTR. Shores of the British Islands. Coast of Sweden, *Areschoug*.

DESCR. *Filaments* forming soft, silky tufts, 6–14 inches long, with something of a main stem, from which spring very numerous, long, and much divided, angularly twisted branches, plentifully clothed with comb-like branchlets, whose secund ultimate ramuli are very slender, elongated, erecto-patent, and straight or slightly incurved. *Colour* a fine rich yellow green, which fades in some degree when the plant is dried, but a silky gloss is generally retained. *Articulations* tolerably uniform throughout the frond, 3–5 times longer than broad. *Substance* soft and pliant, not gelatinous, and the plant adheres but imperfectly to paper in drying.

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I received this plant in 1833, from Mrs. Griffiths, under the specific name here adopted; and not long afterwards excellent specimens were published by Mrs. Wyatt, in her “*Algæ Danmonienses*,” so often quoted. As far as British species are concerned the student will find little difficulty in recognizing it; the only ones with which it can be confounded are *C. flexuosa*, than which it is much more luxuriant, more glossy, and more branching; and *C. Kaneana* (Mc’Calla) which is softer, more flaccid, and much more slender and delicate. But the exotic species of this puzzling genus have not been sufficiently compared together to judge to which of them it most nearly approaches, or whether it may

not be identical with some European form which passes under a different name. I have sometimes feared that it should be referred to *C. sericea* of Roth.

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Fig. 1. CLADOPHORA GRACILIS :—*natural size*. 2. Fragment :—*magnified*

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## PLATE XIX.

HALISERIS POLYPODIOIDES, *Ag.*

GEN. CHAR. *Root*, a mass of woolly filaments. *Fronde* flat, linear, membranaceous, with a mid-rib. *Fructification*: ovate spores, forming distinct sori, or groups, mostly arranged in longitudinal lines. *Grev.*  
 HALISERIS—from ἅλς, the sea, and σέρις, endive.

HALISERIS *polypodioides*; frond dichotomous, entire at the margin, plane; spots of fructification linear, disposed along the mid-rib.

HALISERIS *polypodioides*, *Ag. Sp. Alg.* vol. i. p. 142. *Syst.* p. 262. *Spreng. Syst. Veg.* vol. iv. p. 328. *Grev. Alg. Brit.* p. 64. t. 8. *Hook. Br. Fl.* vol. ii. p. 283. *Mack, Fl. Hib.* part 3. p. 178. *Wyatt, Alg. Danm.* no. 12. *Harv. Man.* p. 30. *Kütz. Phyc. Gen.* p. 340. t. 23. *Mont. Pl. Cell. Canar.* p. 148.

DICTYOPTERIS *polypodioides*, *Lamx. Journ. Bot.* p. 19. sec. *Ag.*

DICTYOPTERIS *elongata*, *Lamx. l. c.* p. 18. sec. *Ag.*

FUCUS *polypodioides*, *Desf. Fl. Atl.* vol. ii. p. 421. *Lamx. Dict.* p. 32. t. 24. f. 1.

FUCUS *membranaceus*, *Stack. Ner. Brit.* p. 13. t. 6. *Turn. Syn. Fuc.* vol. i. p. 141. *With. vol. iv.* p. 93. *E. Bot.* t. 1758. *Turn. Hist.* t. 87.

FUCUS *ambiguus*, *Clem. Ess.* p. 310.

ULVA *polypodioides*, *Dec. Fl. Fran.* vol. xi. p. 15.

HAB. On rocks and stones in the sea, from two to five fathoms. Perennial. Summer and Autumn. Rare. Several places along the southern shores of England, where *Mr. Stackhouse* first gathered it. *Shields, Mr. Winch.* Miltown Malbay, *W.H.H.* (1831). *Youghal, Miss Ball.* Roundstone Bay, *Mr. Mc'Calla.* Jersey, *Miss White; Miss Turner.*

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. North of Africa, *Desf.* Ceylon, *Herb. Linn.* South Africa, *Ecklon.* Bahia, *Martius.* Canary Islands, very rare, *Despreaux.*

DESCR. *Root* a callous disc, densely covered over with finely divided, tough, matted fibres. *Fronde*s growing in tufts, 4–12 inches high, about half an inch wide, linear, several times dichotomous, the axils patent, traversed by a dark coloured, filiform mid-rib, which is very strong below, and becomes gradually thinner upwards. The apices of the segments are obtuse or emarginate, in which case the tip of the mid-rib is forked. The margin is flat, and entire. The membrane of the frond is rather rigid, thin, and tears with great facility in an oblique direction from the margin to the mid-rib, and the lower parts of full grown fronds are very generally much lacerated. Not unfrequently proliferous shoots are produced, especially from old, weather-beaten plants, at points along the mid-rib. *Fructification* of two kinds has been observed, on distinct individuals. The first and *regular* kind consists in oblong sori or groups of elliptical spores lying close at either side of the mid-rib; the second in scattered single spores (?) of larger size than the former, dispersed over the frond. *Colour*, a clear olive-green, with a tinge of yellow; becoming foxy in age, and darker in a dry state. *Smell* when freshly gathered, strong and disagreeably pungent.

The subject of the present plate, though in some degree known to Linnæus, who confounded it with *Fucus distichus*, was first clearly described by Desfontaines in 1798, under the name of *Fucus polypodioides*; and in 1801 figured by Mr. Stackhouse in the first number of his "Nereis Britannica," under that of *Fucus membranaceus*. The former appellation, which alludes to the resemblance which its fructification bears to that of a Polypodium has been generally adopted. As may be seen by the number of stations on record, this plant is widely distributed over the warm parts of the world. In the British Islands it is decidedly rare, and chiefly found on the southern and western shores. It does not appear to be found in Scotland. In the south of Europe it is common, especially in the Mediterranean, and has been brought from the tropics of either hemisphere. I have not seen Cape specimens, but Ecklon is reported to have gathered it in Algoa Bay.

Mrs. Griffiths, who first discovered the scattered spores, finds occasionally specimens in which the frond is marked, in the place usually occupied by the *sori*, with brown, wavy, map-like lines enclosing spaces which are usually more transparent than the rest of the frond. They probably indicate a diseased state of the fruit-producing cells.

Several other species of *Haliseris* are now known, all natives of warm latitudes, and all with much the same habit. Some have thick, almost coriaceous fronds; and others are much more tender and delicate than the European species; some have serrated, and others crisped margins; but the mode of branching is similar in all.

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Fig. 1. HALISERIS POLYPODIOIDES, with sori. 2. A segment, with scattered spores:—*natural size*. 3. Portion of a frond with scattered spores. 4. Portion of a frond with a sorus. 5. Spores from the sorus:—*all more or less highly magnified*.

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## PLATE XX.

PHYLLOPHORA BRODIÆI, *J. Ag.*

GEN. CHAR. *Fronde* stipitate, rigid-membranaceous, proliferous, nerveless or with a vanishing nerve, cellular; cells minute, angular, gradually smaller toward the surface. *Fructification* of two kinds, on distinct plants ;—1, prominent *tubercles* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length dissolved into *spores* (?). 2, *tetraspores* collected into sori, either toward the apex of the frond, or on proper leaflets. PHYLLOPHORA—from φύλλον, a leaf, and φορέω, to bear : a proliferous frond.

PHYLLOPHORA *Brodiaei*; stem cylindrical, filiform, branched, the branches expanding into oblong, simple or forked, flat, membranaceous frondlets, which are proliferous from their extremity; tubercles sessile on the tips of the segments.

PHYLLOPHORA *Brodiaei*, *J. Ag. Alg. Medit.* p. 93. *Endl. 3rd Suppl.* p. 38.

COCCOTYLUS *Brodiaei*, *Kütz. Phyc. Gen.* p. 412.

CHONDRUS *Brodiaei*, *Grev. Alg. Brit.* p. 133. *Hook. Brit. Fl.* vol. ii. p. 303. *Mack. Fl. Hib.* part 3. p. 202. *Harv. Man.* p. 78.

SPHÆROCOCCLUS *Brodiaei*, *Ag. Syn.* p. 27. *Lyngb. Hyd. Dan.* p. 11. t. 3. *Ag. Sp. Alg.* vol. i. p. 239. *Ag. Syst.* p. 213. *Grev. Fl. Edin.* p. 295.

DELESSERIA *Brodiaei*, *Lamx. Ess.* p. 37.

FUCUS *Brodiaei*, *Turn. Hist.* t. 72. *E. Bot.* t. 1966. *Fl. Dan.* t. 1476.

Var. *β. simplex*; stem short expanding into an oblong, simple or once forked, rose coloured frond; sorus elliptical, composed of tetraspores.

CHONDRUS *Brodiaei*, *β. simplex*, *Grev. Alg. Brit.* p. 133. *Hook. Br. Fl. l. c.* *Harv. Man. l. c.* *Wyatt, Alg. Brit.* no. 121.

FUCUS *membranifolius*, var. *roseus*, *Turn.* t. 74. f. *m.*

HAB. On rocks in the sea. Rare. Perennial? Winter and Spring. Eastern coast of Scotland, in several places. Lossiemouth, *Mr. Brodie*. Mouth of the Bann, Co. Derry, *Mr. D. Moore*. At Bangor, on Belfast Bay, *Mr. W. Thompson*. Var. *β*, Devonshire, *Mrs. Griffiths*. Malahide, *Mr. Mc'Calla*.

GEOGR. DISTR. Baltic Sea, *Mertens*. Denmark, *Lyngbye*. German Ocean. Atlantic coast of France, rare.

DESCR. *Root* a small disc; in *β*, a widely expanding disc. *Fronde* 2–8 inches high; the stem cylindrical, variable in length, simple or branched, the branches expanding into oblong, flat, forked or simple, wedge-shaped leaves, which vary in breadth from two to five lines, and in length from one to three inches. The *segments* are somewhat truncate, often proliferous from



the apex, the young shoot rising with a cylindrical stem, which soon expands into a frondlet resembling the primary one, and this in old specimens often gives birth to a second or third. *Tubercles* or *nemathecia* very convex, dark red, sessile on the tips of the frond, composed of dichotomous, densely packed, moniliform filaments, radiating from a centre.— $\beta$ . is not quite two inches high, once or twice proliferous, of a fine rose-red colour, the frondlets often bearing above the middle a broad, elliptical, dark-red, thickened spot, composed of *tetraspores*.

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“The study of natural history,” remarks Mr. Turner in his history of the present species, “independantly of the advantages so nobly ascribed by Cicero to polite literature in general, that it nourishes our youth, delights our age, is an ornament in prosperity, and a comfort in adversity, may justly boast a still superior object, in leading, and, indeed, in forcing man to the admiration of the wisdom, and the goodness of his divine Creator, in the contemplation of the works of his Almighty hand. In addition to this it mixes itself also with the daily occurrences of social life, and gratifies the best feelings of our nature, by uniting in the bonds of friendship those whose pursuits were already the same; while, by permitting the names of its votaries to be affixed to plants, it records their zeal in its service, and touches one of the most powerful springs of human action. Among those who eminently deserve to be thus mentioned, stands forward the name of James Brodie, Esq., of Brodie, in Scotland, a man at once zealous in the pursuit, and liberal in the patronage of universal science, and especially of the Botany of Britian.” Mr. Brodie was particularly attached to the study of the Algæ, among which he made many interesting discoveries, the present among the number, and during a long and active life, enjoyed the affectionate respect of a large circle of scientific friends; the genus *Brodiaea* is consecrated to his memory. The specimen of *Phyllophora Brodiaei*, which I here represent was collected by Mr. Brodie, and given to me among many others by Dr. Walker Arnott, the present owner of the Brodiæan Herbarium.

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Fig. 1. PHYLLOPHORA BRODLÆI, var.  $\alpha$ . 2. Var.  $\beta$ :—*natural size*. 3. Frondlet of var.  $\beta$ , with sorus. 4. Tetraspores from the same. 5. Section of nemathecium. 6. Filaments from the same. 7. Spores (?) from the same. 8. Section of the frond, to show the internal structure:—*all more or less magnified*.

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## PLATE XXI.

SEIROSPORA GRIFFITHSIANA, *Harv.*

GEN. CHAR. *Fronde* rosy, filamentous; stem articulated, one-tubed, the articulations traversed by jointed filaments; *branches* jointed, one-tubed. *Fruit*: oval *tetraspores* disposed in terminal, moniliform strings. Favellæ? SEIROSPORA—from *σειρά*, a *chain*, and *σπόρος*, a *seed*; chain-seed.

SEIROSPORA *Griffithsiana*.

CALLITHAMNION *seirospermum*, *Griff. in Harv. Man.* p. 113.

CALLITHAMNION *versicolor*,  $\beta$ . *seirospermum*, *Harv. in Hook. Journ. Bot.* vol. i. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 216. *Wyatt, Alg. Danm.* no. 19.

HAB. On rocks and stones in the sea, in four to six fathoms water. Rare. Annual. Summer. At Torquay, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Portaferry, *Mr. W. Thompson*. Arran, *Rev. D. Landsborough*.

GEOGR. DISTR. British Islands, rare. Sweden, *Areschoug*.

DESCR. *Root* a small disc. *Stems* solitary or slightly tufted, 1–3 inches high, setaceous, generally undivided, more or less opaque and veiny; the *veins*, which are internal, articulated fibres, originating at the insertion of the branches, and traversing the stem in a downward, root-like direction. *Branches* tetrastichous or sub-distichous, numerous, long, simple, alternate, patent, issuing along the length of the stem from a short distance above the base to the apex, closely set; the lowest longest, the upper gradually shorter; so that the general outline of the frond is triangular ovate. The larger branches often bear a second set of similar branches. All are more or less furnished with sub-dichotomous, multifid, level-topped ramuli, with a narrow-obovate outline, jointed, the joints 2–4 times longer than broad, somewhat swollen upwards. The *tetraspores* are elliptical, triangularly divided, arranged in beaded, dichotomous strings at the tips of the branches; that is to say, speaking morphologically, the articulations of the terminal ramuli are transformed into tetraspores. *Colour* a fine rosy red. *Substance* gelatinous, flaccid, and closely adhering to paper.

This beautiful plant was discovered by Mrs. Griffiths in the Autumn of 1833, and by that acute observer was at once pronounced to be a new species. I was not so confident of its claims to this distinction, and first described it as a variety of *Callithamnion versicolor*, chiefly remarkable for a curious modification of fruit. There is, indeed, a close resemblance to strong growing plants of *C. versicolor*, so close that we are driven to look

to the fructification for marks of difference. Here, however, the characters are so broadly defined, that if we regard the fruit of our *Seiropora* as being *normal*, according to the view first taken by Mrs. Griffiths and latterly though with some hesitation and reluctance adopted by me, we shall be compelled to form a new genus for its reception. In *Callithamnion* the tetraspores are borne laterally along the ramuli; here the ramuli themselves are converted at maturity into strings of tetraspores; a tetraspore being formed *within* each of the articulations of the ramulus. This character is quite as strong, in a generic view, as that which separates any other genus of *Ceramiceæ*, and amply sufficient to distinguish the plant from *Callithamnion*.

Additional strength has certainly been latterly given to the view taken by Mrs. Griffiths, by the plant having been found in three new and widely separated habitats, namely, in Ireland, in Scotland, and in Sweden. I trust, therefore, that the species is well established.

The specimen here drawn is a remarkably fine one, which I owe to the kindness of Mrs. Wyatt who gathered it at Salcombe. Average specimens are not much more than half the size.

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Fig. 1. SEIROSPORA GRIFFITHSIANA :—*natural size*. 2, Portion of a branch.  
3. Portion of the main stem. 4. Ramulus with a cluster of tetraspores  
5. Tetraspores removed :—*all highly magnified*.

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PLATE XXII.

ECTOCARPUS HINCKSIÆ, *Harv.*

GEN. CHAR. *Filaments* capillary, jointed, olive or brown, flaccid, single-tubed. *Fruit*, either spherical, elliptical, or lanceolate *utricles*, borne on the ramuli, or imbedded in their substance. ECTOCARPUS—from ἐκτός, external, and καρπός, fruit.

ECTOCARPUS *Hincksiæ*; tufted, dark olive; *filaments* irregularly and distantly branched; *branches* flexuous, furnished with secund ramuli pectinated on the upper side; utricles conical, sessile, lining the inner face of the ultimate ramuli.

ECTOCARPUS *Hincksiæ*, *Harv. Man.* p. 40.

HAB. Parasitical on *Laminaria bulbosa*. Annual. June. At Ballycastle, *Miss Hincks*. Torbay, *Mrs. Griffiths*; *Mrs. Wyatt*. Aberdeen, *Dr. Dickie*. Plymouth, *Rev. W. S. Hore*. Mounts Bay, Cornwall, abundant, *Mr. Ralfs*.

GEOGR. DISTR. British Islands.

DESCR. *Filaments* 1–2 inches high, dark olive, somewhat rigid for the genus, (the substance very similar to that of *E. littoralis*), irregularly and rather distantly branched, not matted together. The *branches* are furnished in the upper part with secund spreading or somewhat recurved ramuli, which bear on their inner faces a second series of closely set, subulate ones; the compound ramulus resembling a little comb. *Utricles* conical, sessile, produced along the inner face of the ramuli, one rising from almost every joint, giving to the ramulus the appearance, under a lens of low power, of being serrated.

My first knowledge of this species was from a solitary specimen gathered in 1840, by Miss Hincks, daughter of the venerable and respected Dr. Hincks, of Belfast. Though I had then seen but one specimen, yet so striking were its characters that I did not hesitate to describe it forthwith as a new species; and I had much pleasure in dedicating it to its discoverer, to whom I am indebted for many beautifully prepared and judiciously selected specimens of *Algæ*, and from whose explorations of our northern shores much more novelty may be expected.

Miss Hincks found her specimen on “one of the *Laminariæ*,” but neglected at the time to notice which. The uncertainty of habitat is, however, cleared up by Mr. Ralfs, who finds that in



June, at Mounts Bay, Cornwall, the stems of *L. bulbosa*, are almost exclusively infested with this rare plant. I did not find this to be the case last summer at Valentia, where *E. fasciculatus* was the prevailing parasite, nor has any other observer found *E. Hincksiæ* in similar abundance. Nevertheless it is, perhaps, not uncommon, but without a careful inspection may be overlooked. A pocket lens is, however, amply sufficient to detect it, the comb-like, often scorpoid, ramuli affording an obvious character. When growing, as it sometimes does, mixed with *E. siliculosus*, the brighter and more glossy, and softer threads of the latter may be readily discriminated.

I shall look forward with interest to its occurrence on the Continent. It ought to inhabit most of the Atlantic shores of Europe, but I cannot find any description that agrees with it.

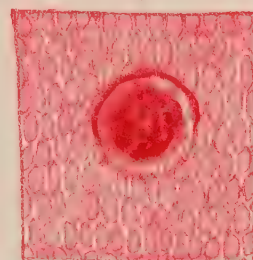
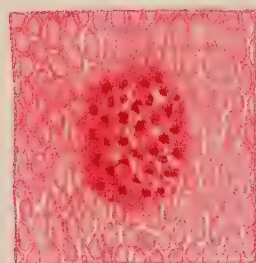
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Fig. 1. *ECTOCARPUS HINCKSIÆ*:—*natural size*. 1. A portion of a filament. 3. A pectinate ramulus. 4. Joints of the main filament. 5. Fertile ramulus. 6. The same, after the discharge of the sporaceous matter:—*all more or less highly magnified*.

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## PLATE XXIII.

NITOPHYLLUM BONNEMAISONI, *Grev.*

GEN. CHAR. *Frond* membranaceous, reticulated, rose-red, (rarely purplish), irregularly cleft, veinless, or furnished with irregular veins toward the base. *Fructification*, two-fold, on distinct plants: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* grouped into definite *sori* or spots, variously scattered over the frond. NITOPHYLLUM—corruptly formed from *nitor*, to *shine*, and φύλλον, a *leaf*; *shining-leaf*.

NITOPHYLLUM *Bonnemaisoni*; frond shortly stalked, fan-shaped or palmate, variously cleft into numerous wedge-shaped segments, furnished near the base with irregular, vanishing nerves; spots of granules roundish, scattered over the surface of the frond.

NITOPHYLLUM *Bonnemaisoni*, *Grev. Alg. Brit.* p. 81. *Hook. Br. Fl.* vol. ii. p. 287. *Harv. in Mack. Fl. Hib.* part 3. p. 193. *Harv. Man.* p. 58.

DELESSERIA *Bonnemaisoni*, *Ag. Sp. Alg.* vol. i. p. 186. *Ag. Syst.* p. 252. *Grev. Sc. Crypt. Fl.* t. 322.

AGLAIOPHYLLUM *Bonnemaisoni*, *Endl. 3rd. Suppl.* p. 52.

HAB. Growing on the stems of *Laminaria digitata*; and on rocks and stones in 4—5 fathom water. Annual. Summer. Orkney, *Rev. C. Clouston*. Bute, *Dr. Greville*. Larne, *Dr. Drummond*. Youghal, *Miss Ball*. Torquay and Ilfracombe, *Mrs. Griffiths*. Tramore, *Miss Taylor*. Miltown Malbay and Kilkee, *W.H.H.* Strangford Lough, *W. Thompson, Esq.* Jersey, *Miss White*.

GEOGR. DIST. Coast of Normandy, *Bonnemaison*. British Islands.

DESC. *Root* a small disc. *Stem* a quarter of an inch long, cylindrical, expanding into a fan-shaped, delicately membranaceous frond, 2—4 inches in length, and rather broader than its length, rarely quite veinless; usually marked toward the base with more or less evident, vanishing nerves, which sometimes extend considerably up the segments, and sometimes are nearly confined to the very base. The habit of the frond varies much in different individuals, in some the lamina is very broad and not deeply cloven; in others cleft nearly to the base in long ribbon-like segments. The division is pretty regularly dichotomous, but the margin in some specimens is proliferous, giving the frond a very compound aspect. *Colour* a fine rosy red, becoming brownish, especially toward the base, in drying. *Reticulations* (fig. 3, 5.) smaller than in *N. versicolor*. *Tubercles* small, not very prominent, scattered over the frond. *Spots of tetraspores* oblong or roundish, minute, but larger than those of *N. Hilliæ*, very abundantly scattered over the surface. It more or less perfectly adheres to paper in drying.

The fan-like outline, scattered groups of tetraspores, and obscure



basal veins distinguish the present species from other British *Nitophylla*. The nearest in affinity is certainly *N. versicolor*, already figured in this work, from which the basal veins, and the proportionably smaller size of the cellules composing the membrane, together with some small differences, more easily seen than described, distinguish it. From *N. Gmelini*, which it resembles in form, it is at once distinguished by the very different disposition of the tetraspores; from *N. Hilliæ*, by the thinner substance, smaller size, and less minute spots of tetraspores; and from *N. punctatum*, by the different outline of the frond.

The specimens here represented, which are of the average size of those that occur on the west of Ireland, where this species is constantly found growing on the stems of *Laminaria digitata*, are less luxuriant than those figured by Dr Greville. They are quite as large, however, as any Devonshire specimens I have seen. No doubt, at Larne, where all the *Nitophylla* luxuriate, so that the shore is pink with them, the present species reaches a much larger size.

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Fig. 1. NITOPHYLLUM BONNEMAISONI :—with *tetraspores*. 2. A specimen producing tubercles ;—*natural size*. 3. Portion of the frond, with a sorus. 4. tetraspores from the same. 5. Portion of the frond, with a tubercle. 6. Spores :—*all more or less highly magnified*.

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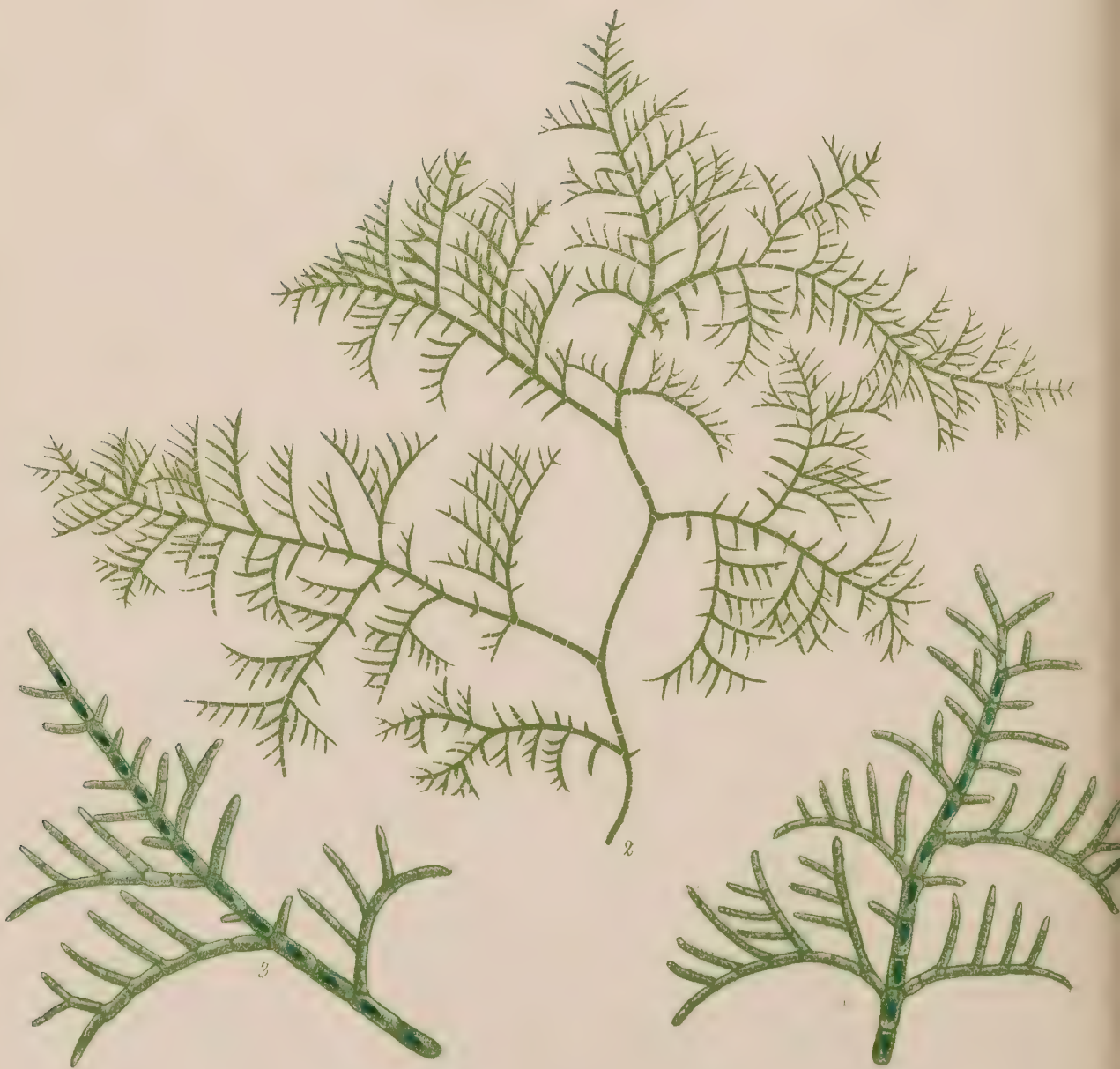




PLATE XXIV.

CLADOPHORA REFRACTA, Kütz.

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper, ciliary motion. CLADOPHORA—from κλάδος, a branch, and φέρω, to bear; a branching plant.

CLADOPHORA *refracta*; filaments capillary, somewhat rigid, tufted, bright green, very much branched; secondary branches spreading on all sides, repeatedly divided, thickly clothed with very much spreading or reflexed, short branchlets, which are pectinated with ramuli on their upper surface; articulations twice or thrice as long as broad.

CLADOPHORA *refracta*, Kütz. *Phyc. Gen.* p. 267.

CONFERVA *refracta*, Roth. *Cat.* vol. ii. p. 193. *Ag. Syst.* p. 114. *Harv. Man.* p. 137. *Wyatt, Alg. Danm.* no 228.

HAB. In rocky pools, left by the tide, near low water mark. Annual. Summer. Dunlecky Castle, Kilkee, *W. H. H.* Ilfracombe, *Mrs. Griffiths*. Mangans Bay, Cork, *Miss Ball*. Giants' Causeway, *Mr. W. Thompson*. Jersey, *Miss Turner*. Falmouth, *Miss Warren*. Mounts Bay, and Torbay, *Mr. Ralfs*. Howth and Balbriggan, *Miss Gower*.

GEOGR. DISTR. Baltic Sea. Shores of the British Islands.

DESCR. *Filaments* densely tufted, 3–4 inches high, slender, rather rigid; the main stems often woven or matted together in rope-like bundles, the secondary branches free, spreading on all sides and much divided; the ultimate branchlets very patent or reflexed, frequently opposite, pectinated on their upper face. Very frequently a minute ramulus stands opposite to a pectinated branchlet, several of which follow each other in a second manner along the stem. *Colour* a brilliant yellowish green, peculiarly glossy when the plant is growing, and partially preserved in drying. *Substance* rather harsh for so slender a plant, very imperfectly adhering to paper.

If our reference to Roth be correct, the present plant was discovered by M. Trentepohl on the shores of the duchy of Oldenburg, about the year 1799, and has been detected since that period on many of the coasts of northern Europe. Specimens communicated to me by M. Areschoug, of Gottenburg, precisely agree with those from the British coasts. It was probably confounded by earlier British writers with *C. albida*, not having been recognized

as British until I gathered it in the year 1833. So many habitats have since been recorded for it, that it may be regarded as a generally distributed *form*, if not *species*.

It most nearly agrees in character with *C. albida*, but the filaments are coarser, and far more rigid, standing out from each other when the tuft is removed from the water; the colour is a brighter and fuller green; the ultimate branches are shorter and more patent, often strongly reflexed, and the general habit is by no means spongy.

It appears to prefer the clearest and purest water, growing on the bare rock or among corallines in deep cold pools left by the tide, near the extreme of low water mark. Where I have seen it, both at Kilkee and Dingle, it could only be reached at spring tides.

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Fig. 1. CLADOPHORA REFRACTA:—*natural size*. 2. Portion of a filament.  
3, 4. Ramuli:—*more or less highly magnified*.

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## PLATE XXV.

## STRIARIA ATTENUATA, Grev.

GEN. CHAR. *Root* a small, naked disc. *Frond* tubular, membranaceous, continuous, branched. *Fructification*; groups of naked, roundish spores, disposed in transverse lines. STRIARIA—from the spores being arranged in transverse *striae* or lines.

STRIARIA *attenuata*; branches and ramuli mostly opposite, tapering to each extremity.

STRIARIA *attenuata*, Grev. *Crypt. Fl. (Syn.)* p. 44. *Alg. Brit.* p. 55. t. 9. Hook. *Br. Fl.* vol. ii. p. 279. *Harv. in Mack. Fl. Hib.* part 3. p. 176. *Wyatt, Alg. Danm.* no. 160. *Meneg. Alg. Ital. et Dalm.* p. 157. *J. Ag. Alg. Medit.* p. 41. *Endl. 3rd Suppl.* p. 26. *Kütz. Phyc. Gen.* p. 336. t. 21. f. 2. *Harv. in Hook. Journ. Bot.* vol. i. p. 298. *Mc'Calla, Alg. Hib.* no. 18.

SCYTOSIPHON *olivascens*, *Carm. MSS.*

CARMICHAELIA *attenuata*, Grev. *Sc. Crypt.* t. 288.

ZONARIA *Naccariana*, *Ag. MSS. Nac. Fl. Ven.* vol. vi. p. 94. *Alg. Adr.* p. 82.

ZONARIA *lineolata*, *Ag. in Diar. Ratisb.* 1827. *Ag. Alg. Eur.* t. 40.

STILOPHORA *crinita*, *Ag. Aufzähl.* p. 17. *Nac. Fl. Ven.* vol. vi. p. 94. *Alg. Adr.* p. 83.

SOLENTIA *crinita*, *Ag. Syst.* p. 186.

SOLENTIA *attenuata*, *Ag. Syst.* p. 187.

ULVA *attenuata*, *Nac. Fl. Ven.* vol. vi. p. 72. *Alg. Adr.* p. 54.

DICTYOTA *lineolata*, Grev. *Syn.* pl. xliii.

CONFERVA *crinita*, *Ruch. Fl. Ven.* p. 269.

HAB. Parasitical on the smaller Algæ, generally growing beyond the tide range. Annual. Summer. Appin, *Capt. Carmichael*. Bute, *Dr. Greville*. Belfast Lough, *Dr. Drummond*. Strangford Lough, *Mr. W. Thompson*. Torbay, *Mrs. Griffiths*; *Miss Cutler*. Roundstone Bay, *Mr. Mc'Calla*. Devonport, *Mr. Ralfs*; *Rev. W. S. Hore*. Penzance and Ilfracombe, *Mr. Ralfs*.

GEOGR. DISTR. Shores of British Islands. Coast of Sweden, *Areschoug!* Mediterranean Sea.

DESC. *Root* a small, scutate disc. *Fronds* tufted, 3–12 inches long, or more, from half a line to one or two lines in diameter, tubular, tapering to each extremity, furnished at short intervals with branches similar in form, but of rather less diameter than the main frond, which are again beset with smaller ramuli. *Branches* and *ramuli* mostly opposite, sometimes in threes, rarely scattered, patent, all much constricted at their insertion, and produced at their apices into very fine, setaceous points. When in *fructification*, the branches, in all parts of the frond, are marked, at spaces of half a line asunder, with transverse rings or bands composed of clusters of roundish

spores, lying exposed on the surface of the membrane, and slightly prominent, among which are occasionally seen a few short filaments, similar to those that accompany the spores in several other *Dictyotæ*. *Substance* of the frond delicately membranaceous, closely adhering to paper in drying. *Colour* a pale olive. *Reticulations* of the frond large, quadrate.

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As far as the British Flora is concerned, the merit of having discovered this plant belongs to the late talented and indefatigable Captain Carmichael of Appin, who detected it upon the west coast of Scotland, in the year 1825 or 1826. In 1827 a figure of it appeared in Dr. Greville's 'Cryptogamic Flora'; in 1831 it was discovered in Ireland, and in 1833 added to the Flora of Devonshire. But if the very numerous synonymes detailed above, and many of which I have transferred from the excellent work of Meneghini, all belong, as there is little doubt, to our plant, it was first observed in the Mediterranean Sea, where it appears to be not very uncommon, in several places. Not a little remarkable, as connected with its Mediterranean habitat, is the fact that so far from its appearing to delight in warm latitudes, the specimens from Scotland and from the north of Ireland are in every respect stronger and more luxuriant than those found on the Devonshire coast. Other circumstances, exclusive of climate, probably influence the growth of this, as of many other Algæ, very considerably. Of these the principal appear to be shelter, a quiet sea bottom, and a considerable deposit of alluvial matter. In such localities as Belfast and Strangford Loughs the largest specimens I have seen have been found. One of these, in the possession of Dr. Drummond, is considerably larger than that represented in our figure.

A second species of this genus, *S. fragilis*, J. Ag. will probably be found on our shores. The specimens which I possess, so named by Prof. Agardh, are not in a sufficiently perfect state to enable me to form a decided opinion as to their specific character.

I regret that our plate has been printed in too dark an ink, an error which was not perceived till the impressions had been struck off.

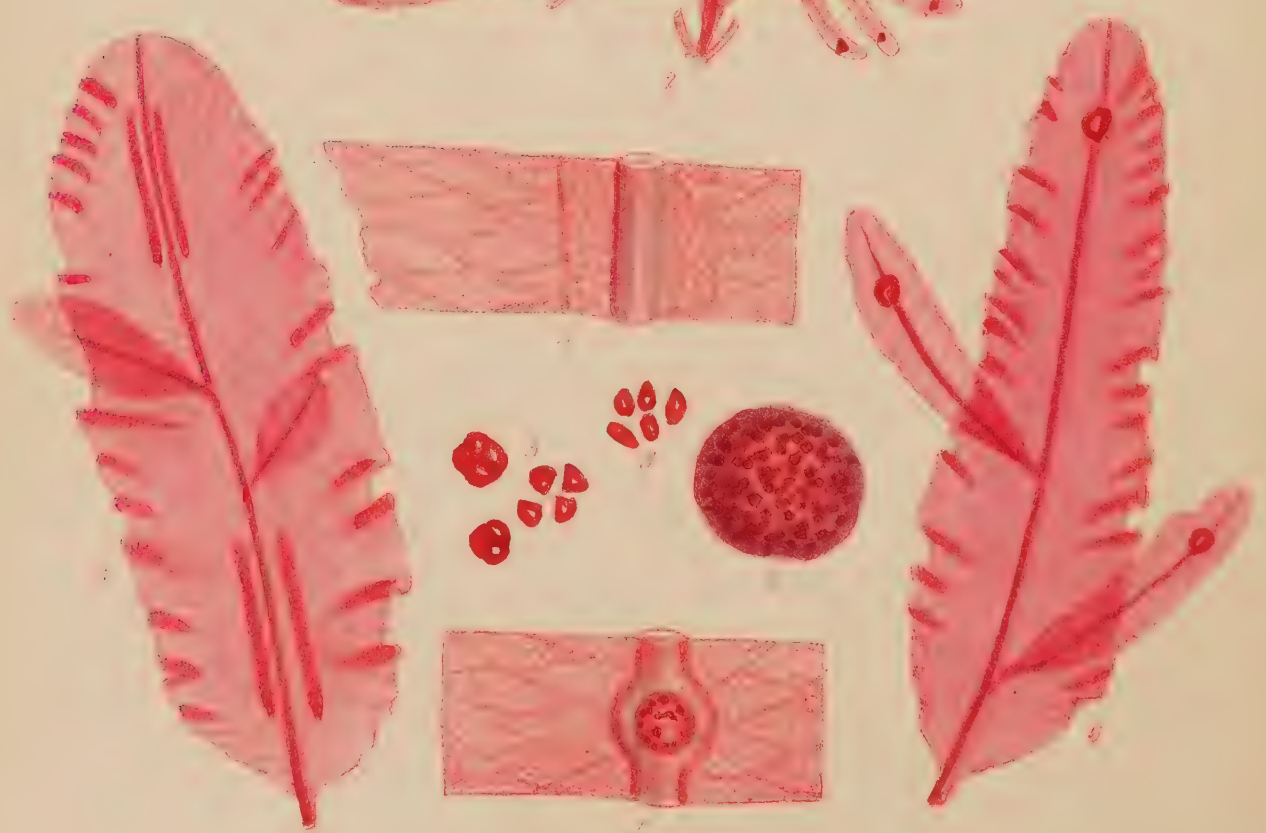
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Fig. 1. *STRIARIA ATTENUATA*; *natural size*. 2. Portion of a branch. 3. A portion of the membrane, with a sorus. 4. Spores from the sorus:—*all more or less magnified*.

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## PLATE XXVI.

DELESSERIA RUSCIFOLIA, *Lamour*.

GEN. CHAR. *Frond* rose-red, flat, membranaceous, with a percurrent mid-rib. *Fructification* of two kinds, on distinct individuals: 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. DELESSERIA—in honour of *Baron Benj. Delessert*, a distinguished Botanist and Patron of Botany.

DELESSERIA *ruscifolia*; frond linear-oblong, obtuse, repeatedly proliferous from the mid-rib with leaflets of a similar form; leaflets traversed by oblique, anastomosing, pellucid striæ; tubercles on the mid-ribs of the smaller leaflets; tetraspores forming linear spots at each side of the mid-rib.

DELESSERIA *ruscifolia*, *Lamour. Ess.* p. 124. *Ag. Sp. Alg.* vol. i. p. 175. *Ag. Syst.* p. 249. *Grev. Alg. Brit.* p. 76. *Hook. Br. Fl.* vol. ii. p. 286. *Harv. in Mack. Fl. Hib.* part 3. p. 192. *Harv. Man.* p. 56. *Endl. 3rd Suppl.* p. 53. *Mc'Calla, Alg. Hib.* no. 12.

WORMSKIOLDIA *ruscifolia*, *Spreng. Syst. Veg.* vol. iv. p. 331.

HYPOGLOSSUM *ruscifolium*, *Kütz. Phyc. Gen.* p. 444.

FUCUS *ruscifolius*, *Turn. in Linn. Trans.* vol. vi. p. 127. t. 8. f. 1. *Syn. Fuc.* p. 11. *Hist.* t. 15. *Sm. Eng. Bot.* t. 1395.

HAB. Generally growing on rocks, near low water mark; sometimes parasitical on other Algæ. Annual. Spring, Summer, and Autumn. Not uncommon on the shores of England and Ireland.

GEOGR. DISTR. Atlantic shores of Europe. Cape of Good Hope, *W. H. H.* Van Dieman's Land, *Mr. Gunn*.

DESC. *Root* a small disc. *Fronds* several from the same base, consisting of a primary leaf 2–4 inches in length, about 4 lines in breadth, linear-oblong, obtuse, undivided, entire at the margin, but often somewhat wavy and curled, with a strong mid-rib, producing numerous other leaves in a proliferous manner, all of similar shape to the primary; and these again producing a third and fourth set, until there results a much branched frond. All the leaflets spring regularly from the mid-ribs of those first formed. The cellules composing the membrane of the leaves are very minute, angular and closely packed; but the substance is traversed with branching and anastomosing, pellucid, jointed striæ or veinlets, composed of a single string of elongated cellules, and running in an oblique direction, from the mid-rib to the margin. *Tubercles* seated on the mid-ribs, generally toward the apices of the younger leaves. *Sori* linear, elongated, forming interrupted lines at each side of the mid-rib. *Colour*, a transparent blood-red. *Substance* more rigid than in *D. Hypoglossum*.

*Delesseria ruscifolia* was discovered on the Yarmouth shore by



Mr. Dawson Turner, who “after having observed its characters for many successive years” published an excellent account of it in the ‘Linnæan Transactions’ in 1801. It has always since been regarded as a distinct species, though confessedly very closely allied to *D. Hypoglossum*, and is now known to occur in the southern Hemisphere, as well as along several of the European shores. Specimens which I have gathered at the Cape of Good Hope appear identical with British ones.

Mr. Turner, in the memoir alluded to, and in his subsequent works, has entered very fully into the points of difference between the present species and its nearest ally, *D. Hypoglossum*, figured in our first number. A comparison of the figures will make these differences obvious. In *D. Hypoglossum* the leaflets are lanceolate, tapering to each end, and generally, but not constantly, acute; in *D. ruscifolia* they are linear-oblong, much broader in proportion to their length, and always very blunt. But besides differences of form, which are not always constant, the cellules composing the membrane in the present species are much smaller, the substance denser and thicker, and the colour more intense than in *D. Hypoglossum*; while the confervoid striæ which traverse the leaves, and are readily seen in *D. ruscifolia*, are either very obscure or do not exist in *D. Hypoglossum*.

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Fig. 1. *DELESSERIA RUSCIFOLIA*; with tetraspores. 2. The same, producing tubercles:—*natural size*. 3. a leaflet, with sori. 4. Portion of the same, showing the pellucid striæ. 5. Tetraspores. 6. Leaflets with tubercles. 7. Portion of the same. 8. Globule of spores, removed from tubercle. 9. Spores separated:—*all more or less magnified*.

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## PLATE XXVII.

WRANGELIA MULTIFIDA, *J. Ag.*

GEN. CHAR. *Fron*d purplish or rose-red, filamentous, jointed; filaments single-tubed. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* affixed to the inner face of the ramuli (not confined to involucre); 2, gelatinous *receptacles* (*favellæ*) terminating the branches, surrounded by an involucre, and consisting of several clusters of pear-shaped spores, compacted together. WRANGELIA (*Ag.*)—in honour of Baron von Wrangel, a Swedish naturalist.

WRANGELIA *multifida*; stems setaceous, pinnate or bipinnate, articulated, each joint bearing a pair of opposite, slender, pinnato-multifid, incurved ramuli, or whorled with numerous sub-dichotomous ramuli; joints of the stem many times longer than broad.

WRANGELIA *multifida*, *J. Ag. Alg. Medit.* p. 79. *Endl.* 3rd *Suppl.* p. 35.

GRIFFITHSIA *multifida*, *Ag. Syst. Alg.* p. 143. *Ag. Sp. Alg.* vol. ii. p. 133. *Harv. in Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* vol. iii. p. 212. *Harv. Man.* p. 102. *Wyatt. Alg. Danm.* No. 43. *M'cCalla, Alg. Hib.* No. 1.

CALLITHAMNION *multifidum*, *Kütz. Phyc. Gen.* p. 373.

CERAMIUM *verticillatum*, *Ducluz. sec. Ag.*

CERAMIUM *Casuarinæ*, *D.C. Fl. Gall. Syn.* p. 8.

CONFERVA *multifida*, *Hudson Fl. Ang.* 596. *Sm. E. Bot.* t. 1816. *Dillw. Conf. Syn.* p. 75.

Var.  $\beta$ , *pilifera*; ramuli very long, simple and hair-like.

GRIFFITHSIA *multifida*  $\beta$ . *pilifera*. *Ag. l. c.* *Harv. l. c.*

HAB. On the perpendicular sides of deep marine pools near low-water mark, under the shade of other Algæ. Frequent on the southern shores of England; and west of Ireland. Belfast Bay, *Mr. Thompson*. Jersey, *Miss White*, *Miss Turner*. Rare in Scotland? Saltcoats (floating), *Miss Margaret Landsborough*.

GEOGR. DISTR. Atlantic coasts of Europe. Rare in the Mediterranean sea.

DESCR. *Root* accompanied by irregularly branching fibres. *Filaments* 4–8 inches high, as thick as hogs' bristles, generally undivided, but furnished throughout their length with lateral, opposite or alternate spreading, distichous or spirally quadrifarious, simple branches similar to the stem; and like it bearing a second or even a third series, which gradually become more and more slender. *Stem* and *branches* jointed, the articulations very variable in length in different specimens, 5–10 times longer than broad, single tubed, with a very wide hyaline border, each bearing at a short distance below the joint either a pair of slender, opposite pinnato-multifid ramuli (which seems to be the normal state of young individuals), or, as shown in our figure,

numerous whorled, multifid incurved ramuli. The articulations of the ramuli are much shorter in proportion than those of the branches, being usually not more than twice or thrice as long as broad; the apices are obtuse. In var.  $\beta$  the ramuli are sometimes simple, and naked, half an inch long or more; sometimes (fig. 3) pinnated with opposite, simple ramelli. *Colour* a fine, transparent, rose-red, perishing quickly in the air or in fresh water. *Tetraspores* minute, roundish with wide borders, sessile on the lower part of the ramuli. *Favellæ* borne on short branches, surrounded by an involucre of multifid ramuli, berry-like, consisting of numerous distinct clusters of large pear-shaped spores, arranged in globose radiating tufts, densely compacted together. *Substance* at first crisp, soon becoming flaccid, and closely adhering to paper in drying.

The description given by Hudson of his *Conferva multifida*, though brief, is so characteristic of the present species that I cannot help agreeing in opinion with Smith, that this is really the plant he intended, although Mr. Dillwyn, who holds a contrary opinion, informs us that an authentic specimen of Hudson's plant, communicated by Dr. Goodenough to Mr. Dawson Turner, proved to be *Griffithsia equisetifolia*. Hudson describes his plant as "subgelatinous, much branched, with *opposite*, long branches; *opposite* multifid, short, slender ramuli, *remote* and as if whorled;" characters which agree well with *Wrangelia multifida*, whose *ramuli* are, I believe, always opposite and not whorled in the young plant; they are *remote*; and the branches are very frequently *opposite*. None of these characters coincide with *G. equisetifolia*.

The genus *Wrangelia*, to which, following the recent views of the younger Agardh, I remove this plant, was founded by Bishop Agardh on a Mediterranean species, which agrees in its fructification with our *W. multifida*, but which has an inarticulate, or rather an opaque, *internally* jointed stem. The structure of the *favellæ*, and the disposition of the *tetraspores* are different from what occur in *Griffithsia*, and the branching of the frond is more pinnate than dichotomous. Some fine species of *Wrangelia* are found in Tasmania and New Holland.

*W. multifida*, originally discovered on the south coast of England, seems to find its greatest perfection and beauty on the west coast of Ireland. Some of the Irish specimens would easily cover a quarto page.

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Fig. 1. WRANGELIA MULTIFIDA :—*natural size*, 2. Portion of a branch. 3. The same, var.  $\beta$ . 4. Ramulus with tetraspores. 5. Tetraspores. 6. Portion of a branch, with a favella. 7. Clusters of spores from the favella.

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be detected in this country, is described as being effused, in the manner of *E. velutina*.

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A. Fig. 1. Branchlet of *Cystoseira ericoides* infested with *Elachistea attenuata*:—*natural size*. 2, Fragment of the same, slightly magnified. 3. Portion of the *Elachistea*. 4. Tubercular base of the same, in its position. 5. A filament and spore:—*all magnified*.

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## PLATE XXVIII. (B).

### ELACHISTEA VELUTINA, *Fries*.

ELACHISTEA *velutina*; spreading in thin, indefinite, velvety patches; filaments very minute, equal in diameter throughout, dissepiments slightly contracted; joints once, to one and a half times as long as broad; spores elliptical, pedicellate, affixed to the lower part of the filaments.

ELACHISTEA *velutina*, *Fries, Flor. Scan.* 317. *Aresch. in Linnæa*, vol. xvi. p. 235. t. 8. f. 9.

MYRIONEMA *velutinum*, *Endl. 3rd Suppl.* p. 23.

SPHACELARIA? *velutina*, *Grev. Crypt. Fl.* t. 350. *Harv. in Hook. Br. Fl.* vol. ii. p. 325. *Harv. in Mack. Fl. Hib.* part 3. p. 181. *Harv. Man.* p. 39.

HAB. Parasitical on *Himanthalia lorea*, frequent. On *Fucus serratus*, *Dr. Greville*. Shores of the British Islands.

GEOGR. DISTR. Atlantic coasts of Europe; probably common.

DESCR. Forming dark olive, velvety patches of indefinite extent on the surface of the fuci affected, rooting in their substance. *Filaments* about a line in height, linear, obtuse, coloured, except at the very base, simple, or occasionally forked at a joint or two above the base. *Articulations* once, or twice as long as broad, slightly contracted at the dissepiments. *Spores* elliptical or oblong, or somewhat obovate, dark olive, with a wide limbus, supported on slender pedicels, which are evidently contracted filaments.

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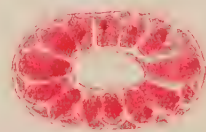
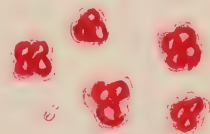
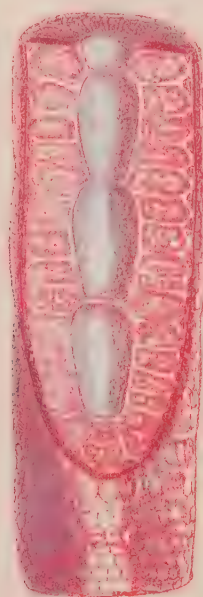
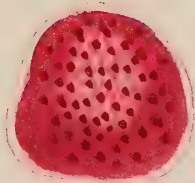
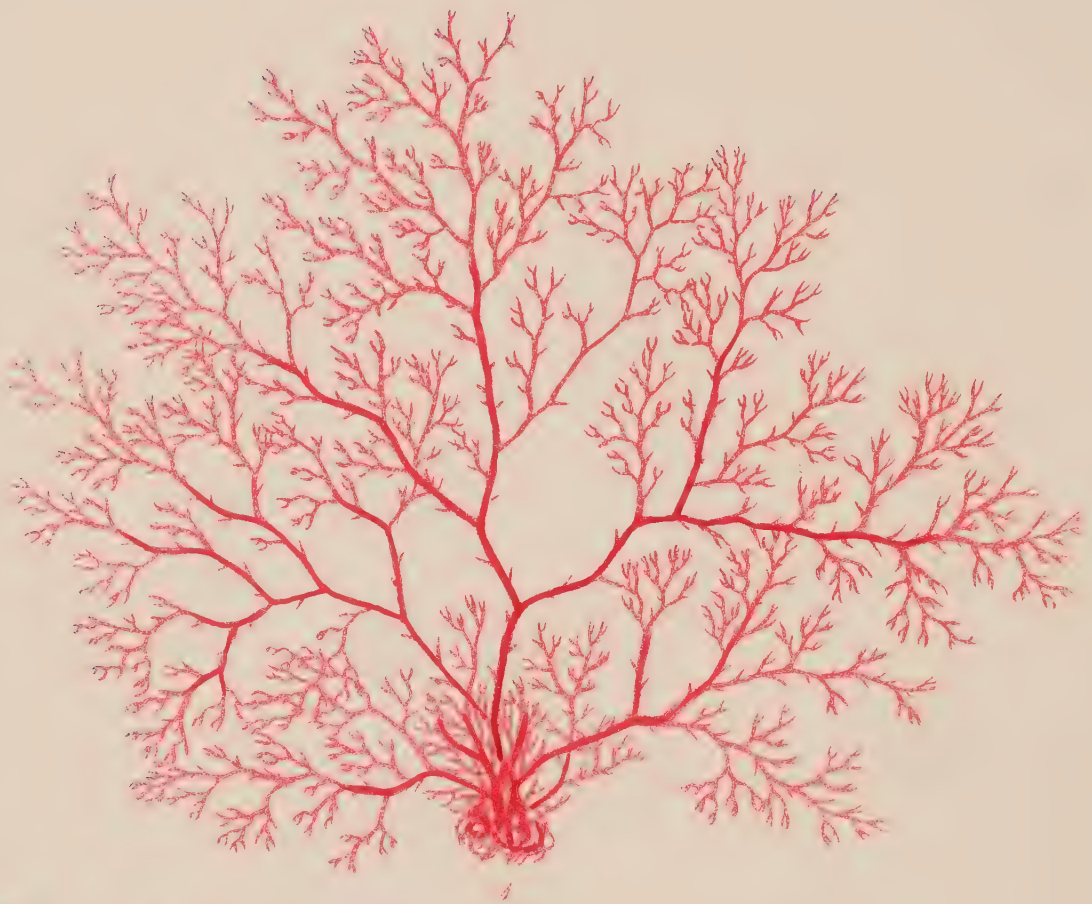
*Elachistea velutina* was first observed by Dr. Greville who published an excellent figure of it in the sixth volume of his 'Cryptogamic Flora'. It occurs commonly on the long strap-shaped receptacles of *Himanthalia lorea*; but I have not seen it on *Fucus serratus*. Mr. Ralfs, who finds it abundantly on the *Himanthalia*, remarks that it very frequently accompanies *E. scutulata*, and often so closely resembles that species that it becomes difficult to distinguish them, except by the form of the spores. Usually, however, *E. scutulata* is readily known by occurring in raised, oval, shield-like patches.

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B. Fig. 1, Fragment of *Himanthalia lorea* infested with *Elachistea velutina*:—*natural size*. 2. Lateral sectional view of a portion of the *Elachistea*, in situ. 3. Portion of the same. 4. Filaments in fruit, detached:—*more or less magnified*.

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## PLATE XXIX.

## MICROCLADIA GLANDULOSA, Grev.

GEN. CHAR. *Fronde* filiform, compressed, distichously branched, traversed by a wide, articulated tube, surrounded, by numerous, large, coloured, angular, radiating cells; external coat formed of minute reticulated cellules. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* immersed in the ramuli; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing numerous minute angular spores, and surrounded by several, short, simple, involucral ramuli. MICROCLADIA (Grev.)—from μικρός, *small*, and κλάδος, a *branch*.

## MICROCLADIA glandulosa, Grev.

MICROCLADIA glandulosa, Grev. *Alg. Brit.* p. 99. t. 13. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. Man.* p. 65. *Wyatt, Alg. Danm.* n. 68. *Kütz. Phyc. Gen.* p. 382. *Endl. 3rd Suppl.* p. 36.

DELESSERIA glandulosa, *Ag. Spec. Alg.* vol. 1. p. 182. *Ag. Syst.* p. 251. *Jones et Kingst. Fl. Devon.* part 2. p. 66.

FUCUS glandulosus, *Soland. MS. Turn. Hist.* t. 38. *E. Bot.* t. 2135.

HAB. Growing on rocks in the sea, or on Algæ, or Sponges, either near extreme low-water mark, or at a greater depth. Very rare. Annual. Summer. Budleigh Salterton, and Torquay, *Mrs. Griffiths*. Falmouth *Miss Warren*. Teignmouth, *Mr. Ralfs*.

GEOGR. DISTR. Southern shores of England. Atlantic shores of France and Spain. Marseilles, *Kützing*. Kamtschatka, *Agardh*.

DESCR. *Roots* fibrous, branching. *Fronde*s tufted, one to four inches high, about a quarter of a line in width, compressed, much branched from the base in an alternate or irregularly dichotomous manner, forming roundish, fastigate tufts. *Branches* distichous, angularly zig-zag, irregularly divided, of nearly equal breadth throughout, the axils very patent, more or less furnished with short, forked or dichotomous ramuli. *Ramuli* 2–3 lines long, once, twice, or repeatedly forked, with rounded axils, and subulate or bifid apices, the points in the latter case hooked inwards. When viewed with a pocket lens of moderate power the frond appears inarticulate, but marked with large reticulations, the internal cells being seen through the semi-transparent cellules of the surface. Under a lens of greater power this appearance vanishes in a great degree, and the frond seems to be closely cellular. A transverse section (fig. 8) exhibits a wide, empty centre surrounded by several large cells filled with granular endochrome, and bounded externally by the numerous minute, much compressed cellules of the surface. A longitudinal section (fig. 7) shows us that the central tube is divided, at regular intervals, into a series of loculi or joints, separated from each other by thin, transparent diaphragms. *Colour* a fine blood or rose-red, darker towards the base, and acquiring a brownish shade in drying. *Substance* cartilagineo-membranaceous, adhering, but not closely,

to paper. *Tetraspores* sometimes cruciate, but generally triangularly divided, immersed in the ramuli, near their apices, and generally disposed in longitudinal series on the outer edge of the branchlet. *Favellæ* sessile on the outer margin of the ramuli, subglobose, or irregularly shaped, occasionally lobed, containing very numerous angular spores, and clasped by two or three short, involucreal ramuli.

We are informed by Mr. Turner, in his 'Historia Fucorum', that a specimen of this beautiful plant, of British origin, but uncertain locality, had long been preserved in the Banksian Herbarium under the MS. name *Fucus glandulosus*, but remained unpublished until Mrs. Griffiths, in September, 1803, fortunately discovered it again upon the Devonshire coast, and enabled him to figure and describe it for the first time. Since that period it has been found, as far as I am aware, in but two other British stations, and in neither of them of such large size as in Torbay. To Miss Warren of Flushing I am indebted for a great number of specimens, and to Mrs. Griffiths for the fine specimen here represented, and others in both kinds of fruit. I believe no one in Britain but Mrs. Griffiths has yet found *Favellæ*. On the continent, *Microcladia glandulosa* is decidedly rare, though found along the shores of France and Spain. Professor J. Agardh omits it in his 'Algæ Maris Mediterranei', but Kützing has received it from Marseilles. Bishop Agardh mentions specimens from Kamtschatka, which, though somewhat different from the European plant, he considers to belong to the same species. This, if correct, is an interesting fact in the distribution of so rare a plant.

As a genus, *Microcladia* is very closely indeed allied to *Ceramium*, with which it agrees in habit, and merely differs in some minor points of structure. Some specimens of *Cer. rubrum* nearly resemble it, but the absence of external joints in the *Microcladia*, is a character sufficiently obvious to distinguish it from the *Ceramium*. *Microcladia glandulosa* is often found tangled with other Algæ, upon which it grows; and sometimes, as Mrs. Griffiths observes, creeps over them in the manner of a *Cuscuta*, throwing out root-like fibres along the branches. These adhere so strongly, that it is impossible to disengage them without laceration.

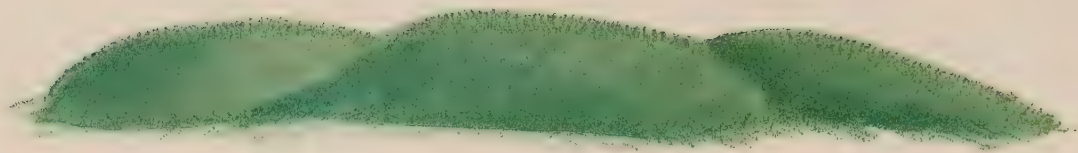
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Fig. 1. MICROCLADIA GLANDULOSA:—*natural size*. 2. A branchlet with favellæ, 3. A favella removed from its involucre. 4. Spores from the same. 5. A branchlet with tetraspores. 6. Tetraspores. 7. A longitudinal section of the frond. 8. A transverse section of the frond:—*all magnified*.

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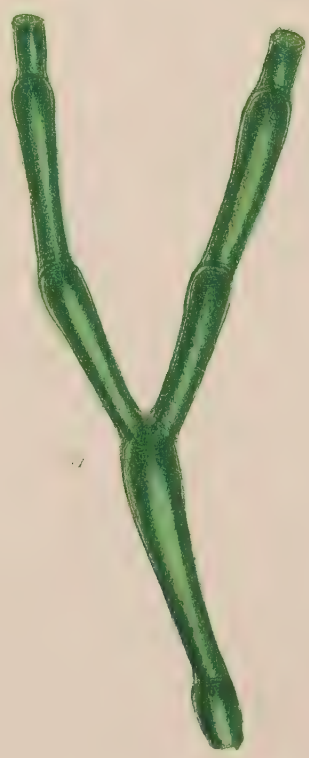
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## PLATE XXX.

CLADOPHORA BROWNII, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit* aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλάδος, a *branch*, and φορέω, *to bear*; a branching plant.

CLADOPHORA *Brownii*; filaments forming dense, cushion-like tufts, erect, rigid, flexuous, elastic, slightly branched; branches few, long, sub-simple, secund; axils acute; articulations four or five times longer than broad, the lower ones thickened upwards, the upper cylindrical.

CLADOPHORA glomerata, γ. *Brownii*, *Hass. Brit. Fr. Wat. Alg.* p. 213.

CONFERVA *Brownii*, *Dillw. Suppl. t. D. Ag. Syst. Alg.* p. 105. *Harv. in Hook. Br. Fl.* 2. p. 355. *Harv. in Mack. Fl. Hib.* part 3. p. 228. *Harv. Man.* p. 134. *Wyatt, Alg. Danm. N.* 225. *E. Bot. Suppl. t.* 2879.

CONFERVA pulvinata, *R. Br. MSS.*

HAB. In maritime situations exposed to the alternate influence of salt and fresh water; rare. Perennial. On wet rocks in a cave near Dunrea, *R. Brown, Esq.* On rocks at the entrance of a small cave beyond Black Castle, Wicklow (1833), *W. H. H.* Cornwall Coast, *Mr. Ralfs.*

GEOGR. DISTR. Ireland. Cornwall.

DESCR. *Tufts* very dense, cushion-like, spreading over the rocks in patches of indefinite extent, one to several inches in breadth, from half an inch to nearly an inch in thickness in the middle, gradually thinner towards the edges, of a black-green colour when growing, but exhibiting, on having the water expressed, and being held between the eye and the light, a beautiful clear, yellow-green tint. *Filaments* so matted together that it is difficult to separate a single thread, very rigid, erect, but apparently originating in a mass of creeping, branched, densely matted fibres, which form the base of the tufts, flexuous, irregularly branched; the branches long, simple, secund or subdichotomous. *Articulations* tolerably uniform in length, the lower ones clavate, the upper cylindrical; joints contracted. Endochrome dense.

Perhaps I transgress the true limits of a work on *marine* Algæ by figuring in it a plant which belongs as much to the land as to the sea, and which is only occasionally wet with sea-water. I have two reasons for doing so. First, because the upper figure in the 'Supplement to English Botany', which was obviously made from dried specimens by an artist who had never seen the living plant, is so unlike the living *C. Brownii* that it is quite

useless as a representation of its natural habit ; secondly, because Mr. Hassall, in his recent work, considers *C. Brownii* to be merely a “condition of *C. glomerata*,” arising “from the subimmersed habitat in which it grows.” This opinion I cannot but regard as being too hasty, especially in an author who had never seen this remarkable plant growing. It is a mere assumption, for there is no evidence to show any passage from the one form into the other ; and the forms themselves are so broadly distinguished that the most casual observer could not confound them. The habit of *Cladophora Brownii* is, as I have long since said, completely that of *Vaucheria terrestris* ; a habit admirably expressed in Mr. Brown’s MS. name “*pulvinata*”. Such is very different from the sprayey branching of *C. glomerata* ; and if this character be regarded as valueless, we must be prepared to unite a host of other species with *C. glomerata*. But, setting aside habit, the rigid and tough substance of *C. Brownii* distinguishes it, even in fragments, from every form of *C. glomerata* that I have seen. The “Prince of Botanists”, who first detected and described it, and whose name it bears, may be allowed to be good authority in this matter. He examined the plant in a recent state ; so have I done ; and so, more lately, has Mr. Ralfs ; and we are agreed in pronouncing it a perfectly distinct species, at least as well characterized as any other specific form in the genus *Cladophora*, and better characterized than several reputed species. I hope the figure now given, and which is a faithful representation of the growing plant, will show that we have some grounds for our opinion.

*Cladophora Brownii* appears to be peculiar to the British Islands, and, so far as I know, has only been found in the stations above given. At Wicklow, I observed it first in 1833 ; and in 1842, when I next visited the station, the plant was still to be found, though not in so luxuriant a state, probably from some failure in the supply of moisture.

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Fig. 1. CLADOPHORA BROWNII :—*natural size*. 2. 3. Filaments removed. 4. Portion of a filament :—*all more or less magnified*.

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## PLATE XXXI.

MESOGLOIA VERMICULARIS, *Ag.*

GEN. CHAR. *Frond* filiform, much branched, gelatinous. *Axis* composed of loosely packed, longitudinal, interlaced filaments, invested with gelatine; the *periphery* of radiating, dichotomous filaments, whose apices produce clusters of club-shaped, moniliform fibres. *Fructification*, obovate spores, seated among the apical fibres.—MESOGLOIA (*Ag.*), from μέσος, the *middle*; and γλοιος, *viscid*; in allusion to the gelatinous axis.

MESOGLOIA *vermicularis*; frond unequally distended, clumsy; branches irregularly pinnate, thick, worm-like, lineari-fusiform; ramuli copious, long, flexuous, resembling the main branches.

MESOGLOIA *vermicularis*, *Ag. Syn.* p. 126. *Lyngb. Hyd.* p. 190. t. 65. *Ag. Syst.* p. 51. *Harv. in Hook. Br. Fl.* vol. ii. p. 387. *Wyatt. Alg. Danm.* no. 100. *Kütz. Phyc. Gen.* p. 332. t. 27. f. 1. *Menegh. Alg. Ital. et Dalm.* p. 279. *Endl. 3rd Suppl.* p. 23.

TRICHOCLADIA *vermicularis*, *Harv. in Mac. Fl. Hib.* part 3. p. 186.

HELMINTHOCLADIA *vermicularis*, *Harv. Gen. S. A. Pl.* p. 397. *Harv. Man.* p. 45.

RIVULARIA *vermiculata*, *E. Bot.* t. 1818.

CHÆTOPHORA *vermiculata*, *Hook. Fl. Scot.* part 2. p. 75.

HAB. On rocks and stones in the sea, about half-tide level. Annual. Summer. Common.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea.

DESCR. *Root* small, discoid. *Fronds* tufted, 1–2 feet high, gelatinous, flaccid, but elastic, with a leading stem, which is either simple, or but slightly divided, somewhat flexuous, unequally distended and constricted at intervals, tapering to the base and apex, and beset throughout its length with very numerous, close, lateral branches. *Branches* similar in form to the stem, of various length, patent, or horizontal, more or less clearly pinnate, or furnished with alternate subdistichous or quadrifarious lesser branches, mixed with short tooth-like ramuli. *Stem* and main *branches* clumsy, from two to five lines or more in diameter, more coriaceous than others of the genus. *Ultimate* branches simple or forked, tapering to an obtuse point; all the axils rounded. *Filaments* of the axis loosely interwoven; their joints pear-shaped or cylindrical:—those of the periphery dichotomous, with globular joints; ultimate fibres about five in a cluster, their joints gradually larger from the base upwards, containing granular matter. *Spores* elliptical-obovate, sessile. *Colour* muddy olive, yellowish, or brown.

This species, the best known and earliest described of the genus, as now restricted, appears to have been first noticed by



Dr. Drummond, who discovered it cast on shore at Larne, in August, 1806;—unless, as Dr. Arnott supposes, it be the *Ulva rubens* of Hudson, a synonyme which I think better referable to *Dudresnaia divaricata*.

It is common on many parts of the coasts of England, Scotland, and Ireland, and is found in the Isle of Jersey by Miss White; but appears to be, in some districts, less common than *M. virescens*. This, Mr. Ralfs remarks, is the case about Penzance, in Cornwall, and on the Welsh Coast. It is frequent in Torbay, and in other localities of the south of England; and very abundant on the west and south-west coasts of Ireland. In the north-east of Ireland, where it was first noticed, Mr. Thompson finds it in profusion, and has observed, among heaps of seaweed cast on shore “the partiality of the *Idotea æstrum*, Leach, for the gelatinous *Mesogloia vermicularis*, plants of which it had very much eaten, leaving the other Algæ, of which there were many species in the heap quite untouched.”

I have given the Mediterranean station on the authority of Professor Meneghini, who has received it from Venice and from Trieste. It is omitted by Agardh in his Algæ Mediterraneæ.

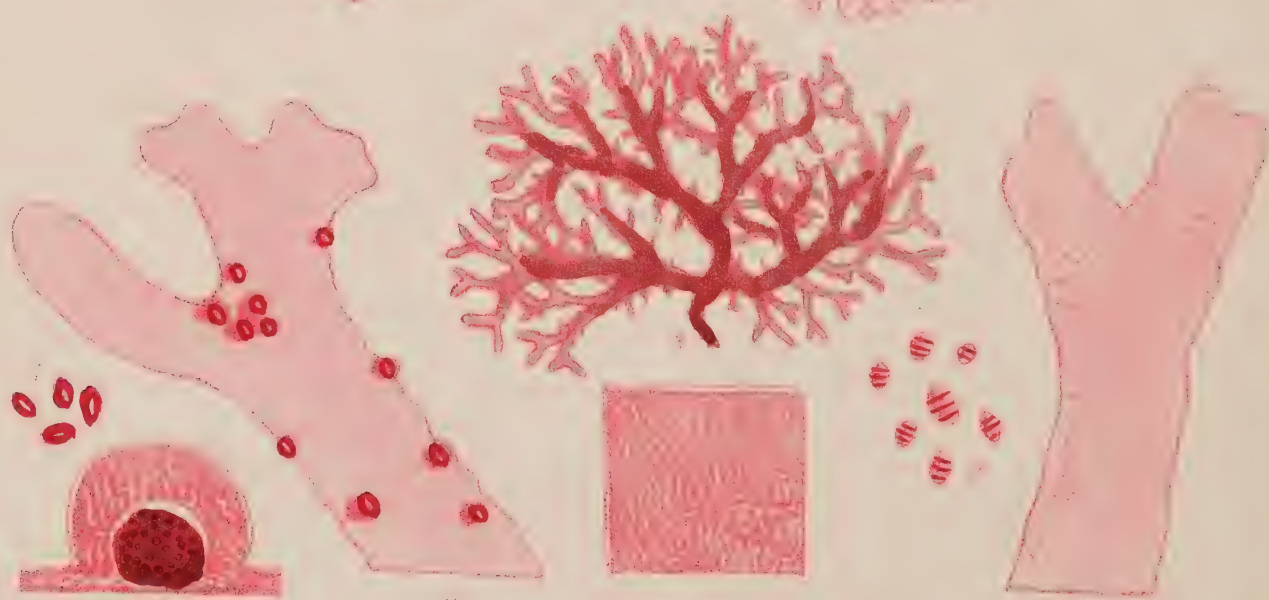
*M. vermicularis* may be considered the type of the genus *Mesogloia*, as now defined by J. Agardh, consisting of that portion of the older genus to which I formerly applied the name of *Trichocladia*, subsequently changed into *Helminthocladia*. When I proposed *M. multifida* of Agardh, as the type of the restricted genus *Mesogloia*, I was not aware that that species is identical in structure with *Nemalion* of Tozzetti. To *Nemalion*, *M. multifida* is therefore now referred; *M. Hudsoni* (of British authors) and *M. coccinea* to *Dudresnaia*; and *M. moniliformis*, Griff. to *Crouania*. Respecting the proper place of *M. purpurea*, Harv. I am at present doubtful.

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Fig. 1. *MESOGLOIA VERMICULARIS*, (small specimen):—*natural size*. 2. Portion of the filaments, axial and peripheral, of which the frond is composed. 3. Apex, with its *spore*, and cluster of ultimate fibres:—*magnified*.

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## PLATE XXXII.

RHODYMENIA BIFIDA, *Grev.*

GEN. CHAR. *Fronde* flat, membranaceous, or subcoriaceous, ribless, veinless, cellular; central cells of small size; those of the surface minute. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick, cellular pericarp, and containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface, scattered, or forming cloudy patches. RHODYMENIA \* (*Grev.*)—from *ῥοδεος*, *red*, and *ὑμῆν*, a *membrane*.

RHODYMENIA *bifida*; frond thin and transparent, rose-red, dichotomously divided from the base; segments linear, or cuneate; apices obtuse; tubercles mostly marginal, sessile; tetraspores transversely zoned.

RHODOMENIA *bifida*, *Grev. Alg. Brit.* p. 85. *Hook. Br. Fl.* vol. ii. p. 289. *Wyatt. Alg. Danm.* no. 66. *Harv. in Mack. Fl. Hib.* part 3. p. 194. *Harv. Man.* p. 60. *Endl. 3rd Suppl.* p. 51.

DELESSERIA *bifida*, *Lamour. Ess.* p. 37.

SPHÆROCOCCLUS *bifidus*, *Ag. Sp. Alg.* vol. i. p. 299. *Syst.* p. 231. *Kütz. Phyc. Gen.* p. 410.

FUCUS *bifidus*, *Goodw. et Woodw. Lin. Trans.* vol. iii. p. 159. t. 17. f. 1. *Sm. E. Bot.* t. 773. *Turn. Syn.* p. 165: *Turn. Hist.* t. 154.

Var. *β*, *ciliata*; frond somewhat thicker than usual, opaque, brownish red, narrow, much divided; the margins fringed with leafy cilia.

*Fucus bifidus*, *β. ciliatus*, *Turn. Syn.* p. 165. *Hist. l. c.*

Var. *γ*, *incrassata*; frond thicker than usual, shrinking and changing to brownish red in drying, broad; segments cuneate, proliferous or ciliate at the margin.

HAB. On rocks in the sea, beyond the influence of the tide, and on Algæ. Annual. Summer. Frequent on the southern shores of England; and along the west, and south, and eastern coasts of Ireland. *Yarmouth, Mr. Wigg.* *Tynemouth, Mr. Winch.* *Belfast Bay, Mr. Templeton.* *Jersey, Miss White.* *Ardrossan, Saltcoats, and Kilbride, Rev. D. Landsborough.* Var. *γ*, *Belfast Bay, Mr. W. Thompson.* *Carriekfergus, Mr. Mc' Calla.*

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea.

DESCR. *Root* discoid, accompanied by fibres. *Fronde* 1–2 or 4 inches high, growing in globose tufts, veinless, thin, delicately membranaceous, dichotomous with more or less regularity, usually much divided; segments

\* Spelled *Rhodomenia* by Dr. Greville; altered to *Rhodymenia* by M. Montagne, as being more in conformity with the Greek.

linear, or slightly widened upwards; in common varieties (fig. 2) from two to four lines wide, sometimes much narrower or much wider; the axils rounded; the apices obtuse, commonly truncate or subemarginate, sometimes rounded, and occasionally slightly tapered. The margin is either entire and plane, or fringed with minute processes, which sometimes lengthen into proliferous foliations. *Tubercles* globose, generally abundant, and sessile along the margin of the segments; rarely scattered over the disc. *Tetraspores* forming cloud-like spots in the upper segments, oblong, divided by three transverse, zone-like lines. *Colour* in Var.  $\alpha$ , a clear, transparent rose-red. Var.  $\beta$ . is very much narrower, and more intricately and irregularly divided, of a darker, often very dark colour, opaque, and thick, and forms entangled tufts. Var.  $\gamma$ . is from half an inch to an inch in breadth, but little divided, cartilagineo-membranaceous, transparent, red when fresh, but becoming brownish, and not adhering to paper in drying; it produces marginal tubercles in abundance. Several other varieties are mentioned by Turner.

Our plate represents three forms of this most variable plant, between the broadest and narrowest of which, innumerable states occur; some of which, like our central figure, which may be regarded as the *normal* state, are of a delicate rosy colour, transparent and membranaceous; while others are more or less incrassated, and, especially when dry, of a brownish red. The specimen represented at fig. 1. was gathered by Mr. Moore on the coast of Antrim, and Miss Hyndman has found, at Bundoran, specimens of equal, or even greater luxuriance.

*Rhodymenia bifida* differs from others of the genus, not merely in being more membranaceous, but in its fructification. The tetraspores, represented at fig. 9, are in it divided by transverse zones, like those of *Plocamium*, of *Catenella*, and of some other Algæ; while in *Rhodymenia proper* they are of the more common tri-partite kind. This character, in the present genus-making age, is perhaps of sufficient importance to justify the removal of *R. bifida* to a new genus; but I am not prepared to say how many, or whether any, others of the *Rhodymeniæ* have similar tetraspores. Should future observations confirm my suggestions, the new genus may be called *Wigghia*, in memory of Mr. Lilly Wigg "the instructor" in marine botany of Dawson Turner, and whose name, however uncouth, ought to be gratefully remembered by British Algologists.

Fig. 1. RHODYMENIA BIFIDA; unusually broad state. 2. The same; normal variety. 3. Var.  $\beta$ :—*all of the natural size*. 4. Fragment of the frond, showing the surface cellules. 5. Segment with tubercles. 6. Vertical section of a tubercle. 7. Spores from the same. 8. Segment with tetraspores. 9. Tetraspores:—*all more or less magnified*.







## PLATE XXXIII.

CLADOSTEPHUS VERTICILLATUS, *Ag.*

GEN. CHAR. *Fronde* inarticulate, rigid, cellular, whorled with short, jointed, subsimple ramuli. *Fructification*; elliptical utricles, furnished with a limbus, pedicellate, borne on accessory ramuli. CLADOSTEPHUS (*Ag.*) —from κλάδος, a branch; and στέφος, a crown.

CLADOSTEPHUS *verticillatus*; branches slender; ramuli mostly forked, regularly whorled, the whorls at short intervals.

CLADOSTEPHUS *verticillatus*, *Ag. Syn. Introd.* p. xxv. *Lyngb. Hyd. Dan.* p. 102. t. 30. *Hook. Fl. Scot.* vol. ii. p. 89. *Grev. Fl. Edin.* p. 312. *Harv. in Hook. Br. Fl.* vol. ii. p. 322. *Wyatt. Alg. Danm.* no. 82. *Harv. in Mack. Fl. Hib.* part 3. p. 179. *Harv. Man.* p. 36.

CLADOSTEPHUS *myriophyllum*, *Ag. Syst.* p. 169. *Ag. Sp. Alg.* vol. ii. p. 10. *Endl. 3rd Suppl.* p. 24. *Kütz. Phyc. Gen.* p. 294. t. 18. f. 1. *J. Ag. Alg. Medit.* p. 30.

CERAMIVM *verticillatum*, *DC. Fl. Fr.* vol. ii. p. 39. *Ducluz. Ess.* p. 49.

CONFERVA *verticillata*, *Lightf. Fl. Scot.* p. 984 (1777). *Huds. Fl. Ang.* p. 653. *With. Arr.* vol. iv. p. 133. *Dillw. Conf.* t. 55. *E. Bot.* t. 1718 and 2427. f. 2. *Roth. Cat. Bot.* vol. iii. p. 309.?

CONFERVA *myriophyllum*, *Roth. Cat. Bot.* vol. iii. p. 312. t. 12. f. b. (1806).

CONFERVA *ceratophyllum*, *Roth. l. c.* p. 311.

FUCUS *verticillatus*, *Wulf. Crypt.* no. 15. t. 1.

HAB. On rocks, stones and corallines, within the influence of the tide. Perennial, fruiting in winter. Very common on the British Shores.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe, abundantly. Cape Frio, Brazil, *Tilesius*.

DESCR. *Fronde* ultra-setaceous, 3–10 inches high, irregularly dichotomous, or subtrichotomous, rigid; *branches* erecto-patent, slender, slightly incurved, furnished throughout their length, at distances of one or two lines, with whorls of short ramuli. *Ramuli* jointed, 1–2 lines long, inflexed, furnished near the apex with one or two diverging tooth-like ramelli, thus appearing forked. *Joints* about as long as broad, longitudinally striate, each stria consisting of numerous cellules. In winter most of the whorled ramuli fall away, and the surface of the frond becomes clothed with irregularly disposed, slender ramuli, densely imbricated, of less diameter than those of the summer, with joints once and half as long as broad, and bi-tri-striate. These produce an abundance of lateral, pedicellate utricles, which we regard as the proper fruit of the plant. The apices of the summer ramuli are frequently distended, and sphacelate, and contain a dark mass, which may be possibly also connected with reproduction. *Colour* dark olive.

A well known species, abundant on most of the shores of



Europe, and found according to Martius, in Brazil. It was originally described by Lightfoot, whose excellent specific name I retain in preference to that of Roth, conferred nearly thirty years subsequently, and which is universally adopted on the continent.

What are described as fruiting ramuli, and represented in our plate at fig. 6, are regarded by Italian authors, the accurate and acute Meneghini included, as a parasitical plant, which De Notaris has named *Sphacelaria Bertiana*. Meneghini in his 'Algæ Italiane e Dalmatiche' enters largely into this question, and zealously defends the parasitical theory; regarding these ramuli as analogous productions to the *Elachistea velutina*, which no one supposes to belong to the plant that it infests. The case of the so called *Sphacelaria Bertiana* is, however, widely different. Unlike the *Elachistea*, which infests more than one species of distinct genera, of a different family of Algæ from that to which it belongs; the *E. Bertiana* is only found on the *Cladostephi*; but on these it is *constantly* produced at a particular season of the year. It, moreover, has the same *structure* as their stem, and certainly is not merely *attached* to the surface, but springs from a prolongation of the peripheric cells, and above all the fruit which it bears is exactly what, from analogy, we should expect on the *Cladostephi*, and, if this be not their fruit, no other has been observed, unless the granular mass within the tips of the whorled ramuli can be called so. These facts, and others that might be adduced, compel me to form a contrary opinion to that defended by Meneghini; and in this opinion I am supported by Mrs. Griffiths, to whom I owe my first acquaintance with these fruit-bearing ramuli, and by the Rev. Mr. Berkeley whose judgment, on all such subjects, is of great authority.

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Fig. 1. CLADOSTEPHUS VERTICILLATUS:—*natural size*. 2. Portion of a branch. 3. Ramuli. 4. Apex of the same. 5. *Sphacelate* apex, of another ramulus. 6. Accessory fruiting ramuli. 7. *Utricle* in situ. 8. Portion of a transverse section of the stem:—*all more or less magnified*.

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## PLATE XXXIV.

ODONTHALIA DENTATA, *Lyngb.*

GEN. CHAR. *Frond* plano-convex, two-edged, vinous-red, distichous, obsoletely ribbed, alternately toothed at the margin, cellular; central and surface-cells minute, irregular. *Fructification* two-fold, on distinct plants; 1, *capsules* (*ceramidia*) furnished with a terminal pore and containing a mass of pear-shaped spores; 2, lanceolate *Pods* (*stichidia*) containing tripartite tetraspores in a double row. ODONTHALIA (*Lyngb.*)—from ὀδούς, a tooth, and φάλος, a germ or branch.

ODONTHALIA *dentata*; frond irregularly pinnate; branches linear-oblong, deeply pinnatifid; laciniae alternate, sharply toothed towards their truncate extremities; capsules and pods clustered, axillary or marginal.

ODONTHALIA *dentata*, *Lyngb. Hyd. Dan.* p. 9. t. 3. *Grev. Fl. Edin.* p. 296. *Grev. Alg. Brit.* p. 101. t. 13. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. Man.* p. 66. *Kütz. Phyc. Gen.* p. 448. *Endl. 3rd Suppl.* p. 47.

RHODOMELA *dentata*, *Ag. Sp. Alg.* vol. i. p. 370. *Ag. Syst.* p. 196. *Spreng. Syst. Veg.* vol. iv. p. 342.

DELESSERIA *dentata*, *Lamour. Ess.* p. 36.

FUCUS *dentatus*, *Lin. Syst. Nat.* vol. ii. p. 718. *Huds. Fl. Ang.* p. 582. *Lightf. Fl. Scot.* vol. ii. p. 952. *With. vol. iv.* p. 102. *Linn. Trans.* vol. iii. p. 158. *Turn. Syn.* vol. i. p. 149. *Stack. Ner. Brit.* p. 95. t. 15. *E. Bot.* t. 1241. *Turn. Hist.* t. 13.

FUCUS *atomarius*, *Gmelin. Hist. Fuc.* p. 125. t. 10. f. 1.

FUCUS *pinnatifidus*, *Fl. Dan.* t. 354 (*excl. Syn. Huds.*).

HAB. On rocks in the sea. Perennial. Fruiting in winter. Abundant on the shores of Scotland, and of the north of Ireland. Coast of Durham and Northumberland, rare, *Mr. Winch.*

GEOGR. DIST. Coast of northern Europe. Iceland. North America, *Gmelin.*

DESCR. *Fronds* rising from a hard disk, tufted, 3–12 inches long, much branched, furnished with an imperfect mid-rib below, which gradually becomes fainter upwards, flat and membranaceous above; the main stem simple, or forked 2–4 lines wide, alternately toothed. *Branches* issuing from the axils of the teeth of the main stem, tapering at the base, simple or subdivided, deeply pinnatifid; the *laciniae* erecto-patent, linear, entire for more than half their length, alternately toothed above, the larger ones pinnatifid, with toothed segments; teeth very acute, erect. *Fructification* born along the margin, or confined to the axils of the teeth, on slender, pellucid stalks, which are either simple or branched, solitary or tufted. *Capsules* somewhat pitcher-shaped, with very wide mouths, containing a cluster of dark red, pear-shaped spores; *stichidia* lanceolate, nearly colourless, containing a double row of dark purple tetraspores. Substance cartilagineo-membranaceous subcoriaceous scarcely adhering to paper. *Colour* a deep vinous-red, becoming darker in drying. The *smell* is agreeably pungent, but the taste is insipid.



The genus *Odonthalia*, founded by Lyngbye on our *O. dentata*, and now containing three other species natives of the Kamtschatkan sea, has been singularly misunderstood by Endlicher, who unites with these northern plants of leathery substance and closely cellular structure, several delicate tropical Algæ with highly reticulated fronds, which have scarcely a character common with *Odonthalia* except that minor one which gives the genus its name,—a *toothed* margin.

*Odonthalia dentata* is peculiarly a northern plant. It abounds throughout the whole of the European, Northern, Atlantic, and North Seas; and probably extends along the coast of Siberia and of North America. In the British Islands, it reaches, perhaps, its southern limit, and is most abundant on the coast of Scotland. In England it does not appear to be found south of Durham, and in Ireland, of Downshire.

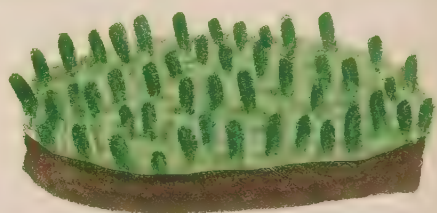
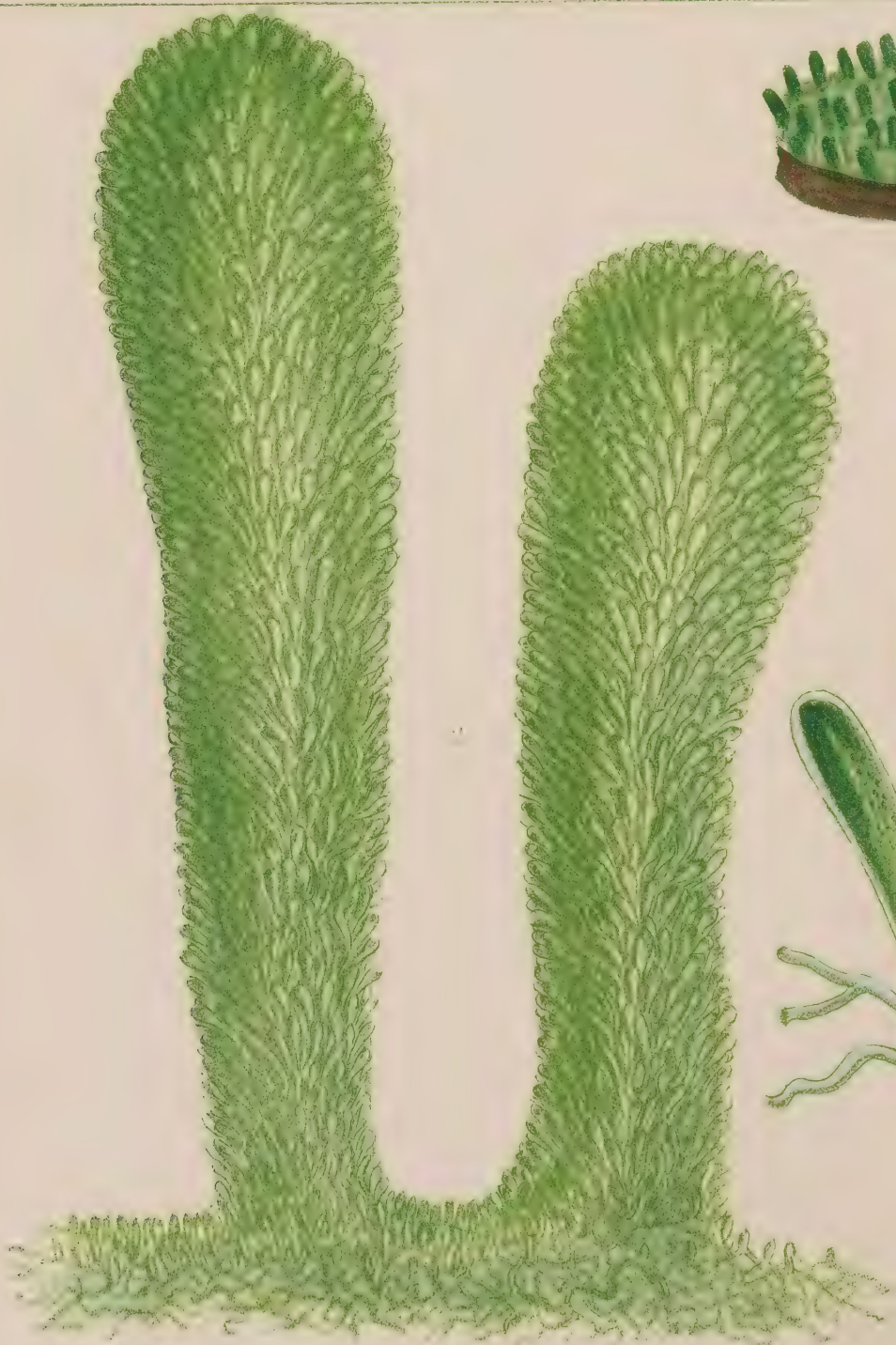
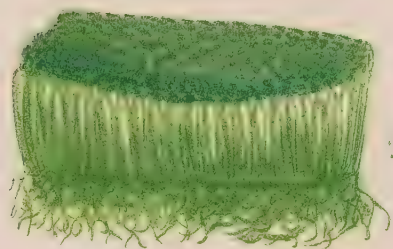
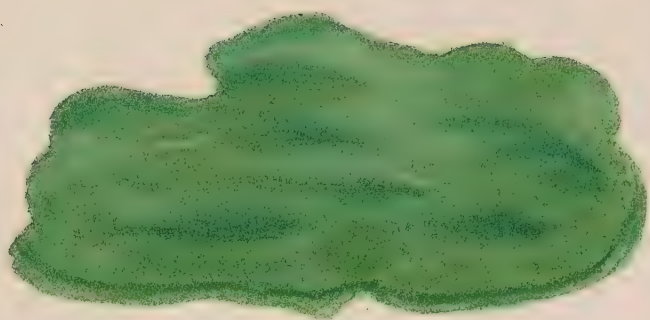
It varies very little in the frond, except that some specimens are more luxuriant than others. The mode of branching, and alternate pinnati-section is invariable; but the fructification presents some varieties. In some specimens, such as I have represented, the stichidia are densely clustered, and, as well as the bunches of capsules, confined to the axils of the segments; in others, both kinds of fruit are scattered along the margin. The specimens from which our figure is drawn were kindly communicated in a fresh state by Dr. Dickie, of Aberdeen.

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Fig. 1. ODONTHALIA DENTATA :—*natural size*. 2. Laciniae bearing capsules. 3. Cluster of capsules. 4. Vertical section of a capsule. 5. Laciniae with pods. 6. Cluster of pods. 7. A pod or stichidium. 8. Tetraspores. 9. transverse section of the lower part of a branch :—*all more or less magnified*.

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## PLATE XXXV. (A).

CODIUM ADHÆRENS, *Ag.*

GEN. CHAR. *Frond* green, sponge-like, (globular, cylindrical, or flat; simple or branched), composed of tubular, interwoven, inarticulate filaments. *Fructification*; opaque vesicles attached to the filaments. CODIUM (*Stackh.*)—from κώδιον, the skin of an animal.

CODIUM *adhærens*; frond forming a velvety crust on the surface of rocks.

CODIUM *adhærens*, *Ag. Sp. Alg.* vol. i. p. 467. *Ag. Syst.* p. 178. *Harv. in Hook. Journ.* vol. i. p. 305. *Wyatt. Alg. Danm.* no. 127. *Harv. Man.* p. 145. *J. Ag. Medit.* p. 22. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 309. *Mont. Pl. Cell. Canar.* p. 183.

AGARDHIA *adhærens*, *Cabrera, sec. Ag.*

HAB. On marine rocks, near low-water mark. Perennial. Summer and winter. Rare. At Torquay, *Mrs. Griffiths*. Sermen Cove, Land's End, *Mr. Ralfs*. At the back of the pier on a vertical rock, at Gorran Haven; and near the Bosand, Gerrans Bay, Cornwall, *Mr. Peach*. Falmouth Harbour, *Miss Warren*.

GEOGR. DISTR. Atlantic coasts of Europe, from the south of England to Spain. Mediterranean Sea. Mauritius? Canary Islands, *Webb*.

DESCR. *Frond* spreading over the surface of the rock in broad, indeterminate patches, of one, two or more feet in diameter, resembling "fragments of beautiful green velvet", composed of an under layer of entangled and interwoven, cylindrical filaments producing on the upper surface linear-clavate, vertical branches, of equal length, parallelly arranged into the even velvety surface of the frond, and being, as it were, the *pile* of the velvet. *Substance* soft and gelatinous, closely adhering to paper. *Colour* a brilliant green, when wet.

I am indebted to Mr. Peach of Fowey for living specimens of this curious plant, which he finds in great perfection at Gorran Haven. It appears to be of slow growth; for Mr. Ralfs informs me, that patches cut out one year, are but partially filled up after twelve months. I am not quite certain that the Mauritius specimens, formerly described by me, are identical with the European.

A. Fig. 1. CODIUM ADHÆRENS:—*natural size*. 2. A portion:—*magnified*. 3. Filaments:—*more highly magnified*.

PLATE XXXV. (B).

CODIUM AMPHIBIUM, *Moore*.

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CODIUM *amphibium*; fronds minute, erect, cylindrical, simple, obtuse, aggregated in widely spreading strata.

CODIUM *amphibium*, *Moore et Harv. in Ann. Nat. Hist.* vol. xiii. (1844) p. 321. pl. 6.

HAB. On turf-banks at extreme high-water mark, near Roundstone, Galway, *Mr. Mc' Calla*.

GEOGR. DISTR. West of Ireland.

DESCR. *Stratum* indefinite, composed of entangled filaments, spreading over the surface of the bog. *Fronde*s rising above the stratum, like papillæ, cylindrical or clavate, from a line to nearly half an inch in height, and from a quarter-line to more than a line in diameter, erect, distinct from each other (not massed together), obtuse, simple; their *axis* composed of branched, interwoven, irregular fibres, which throw off to the circumference club-shaped ramuli, of the same nature, and nearly the same form, as those of *C. tomentosum*. Colour a brilliant green. Substance soft.

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*Codium amphibium* was discovered by Mr. Mc' Calla in October, 1843, spreading in patches of great extent along the edge of the sea, over the surface of a turf-bog which meets the shore at Roundstone Bay. In this situation the plant is exposed alternately to the influence of salt and of fresh water, and, it would appear, is even affected by atmospheric changes: for, its discoverer has observed, that "in dry weather it loses all its characters, the frond shrinking to *a mere nothing*, but on the return of moisture it immediately gets fresh again". Specimens will, I understand, be published in the second volume of M'Calla's '*Algæ Hibernicæ*'.

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B. Fig. 1. CODIUM AMPHIBIUM:—*natural size*. 2. Two of the fronds:—*magnified*. 3. Filaments from the same:—*more highly magnified*.

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## PLATE XXXVI.

NEMALEON MULTIFIDUM, *J. Ag.*

GEN. CHAR. *Frond* cylindrical, gelatinoso-cartilaginous, elastic, solid; *axis* columnar, dense, composed of closely packed, longitudinal, interlaced filaments; the *periphery* of elongated, horizontal, dichotomous filaments, whose ultimate ramuli are moniliform and coloured. *Fructification*; globular masses of spores (*favellidia*), attached to the filaments of the periphery. NEMALEON (*Tozzetti*.)—from *νήμα*, a thread, and *λήιον*, a crop; crop of threads.

NEMALEON *multifidum*; frond dichotomous, slightly branched, dull purple; the axils rounded.

NEMALEON *multifidum*, *J. Ag. in Linnæa*, vol. xv. p. 453. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA *multifida*, *Ag. Syst.* p. 50. *Berk. Alg.* t. 16. f. 1. *Harv. in Hook. Br. Fl.* vol. ii. p. 385. *Mack. Fl. Hib.* part 3. p. 185. *Wyatt. Alg. Danm.* no. 98. *Harv. Man.* p. 47. *Mont. Pl. Cell. Canar.* p. 189.

MESOGLOIA *Balani*, *Carm. MSS.*

CHORDARIA *multifida*, *Lyngb. Hyd. Dan.* p. 51. *Fl. Dan.* t. 1669.

CHÆTOPHORA *multifida*, *Hook. Fl. Scot.* part 2. p. 76.

RIVULARIA *multifida*, *Web. et Mohr. Roth. Cat. Bot.* vol. iii. p. 335.

HELMINTHORA *multifida*, *Kütz. Phyc. Gen.* p. 391. t. 44. f. 3.

Var. *β, simplex*; frond simple or nearly so.

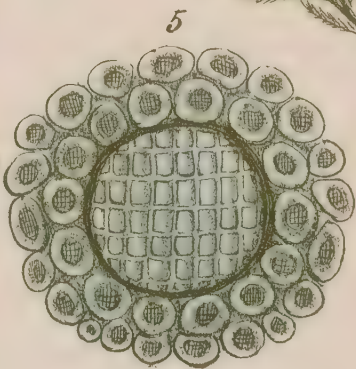
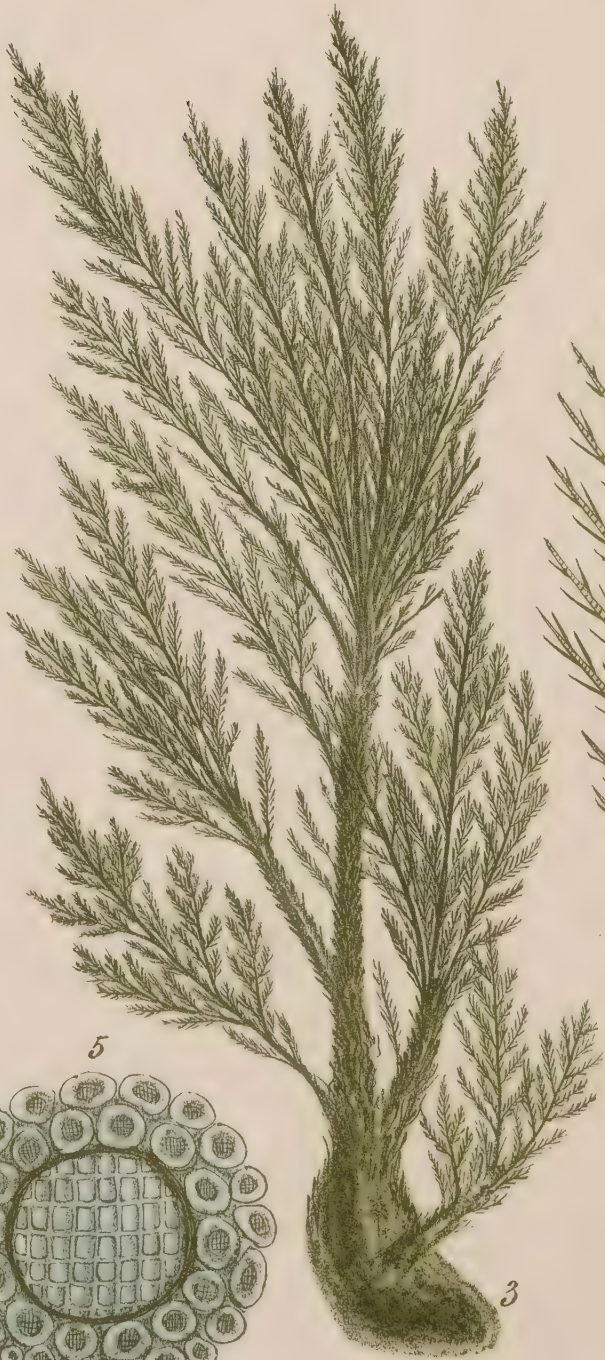
NEMALEON *lubricum*, *Duby. ? et Auct.*

HAB. On rocks, *Balani*, and shells (frequently on *Mytilus rugosus*), near low-water mark, in exposed situations. Common along the western shores of Scotland and Ireland. Downshire, *Mr. Templeton*. Torquay *Mrs. Griffiths*. Falmouth, *Miss Warren*. Balbriggan, *Miss Gower*. Var. *β*, at the Land's End, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea. Canary Islands, *Webb*.

DESCR. *Root* a fleshy, expanded disc. *Fronde*s dull purplish brown, 3–10 inches long, 1–2 lines in diameter, cylindrical, very elastic, firmly gelatinous or somewhat cartilaginous, generally forked near the base, and repeatedly forked at long intervals upwards, but varying much in the degree of furcation. *Axils* all remarkably wide, and rounded; apices but slightly tapered, blunt. *Axis* about one fourth of the diameter of the frond, very dense, compared by *Agardh* to a column, and by *Carmichael* to a “medullary cord”, composed of closely adherent slender filaments, from which issue the long, horizontal, dichotomous filaments of the periphery, whose lower ramifications are colourless, with subcylindrical joints; their upper, and terminal, coloured and beautifully beaded. Occasional reflexed, root-like







## PLATE XXXVII.

SPHACELARIA SCOPARIA, *Lyngb.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple or subdichotomous. *Apices* of the branches distended, membranous, containing a dark granular mass. *Fructification*; elliptical *utricles*, furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*)—from σφάκελος, *gangrene*, alluding to the *withered* tips of the branches.

SPHACELARIA *scoparia*; olive or dark brown, coarse, the lower part shaggy with woolly fibres; upper branches once or twice pinnated; the pinnæ erecto-patent, awl-shaped, alternate, the lower ones pinnulate.

SPHACELARIA *scoparia*, *Lyngb. Hyd. Dan.* p. 104. t. 31. *B. Ag. Syst.* p. 167. *Ag. Syst. Alg.* vol. ii. p. 19. *Grev. Fl. Edin.* p. 313. *Harv. in Hook. Br. Fl.* vol. ii. p. 323. *Harv. in Mack. Fl. Hib.* part 3. p. 180. *Harv. Man.* p. 37. *Wyatt. Alg. Danm.* no. 361. *Ag. Alg. Medit.* p. 29. *Endl. 3rd Suppl.* p. 23. *Meneg. Alg. Ital. et Dalm.* p. 344.

SPHACELARIA *disticha*, *Lyngb. l. c.* p. 104. t. 31. *A. Ag. Sp. Alg.* vol. ii. p. 26. *Harv. in Hook. Br. Fl.* vol. ii. p. 323.

SPHACELARIA *scoparioides*, *Lyngb. l. c.* p. 107. t. 32. *C. Ag. Syst.* p. 165.

CERAMIMUM *scoparium*, *Roth. Cat. Bot.* vol. iii. p. 141. *Ag. Syn.* *Hook. Fl. Scot.* part. 2. p. 86.

CONFERVA *scoparia*, *Linn. Syst. Nat.* vol. ii. p. 720. *Huds. Fl. Angl.* p. 595. *Lightf. Fl. Scot.* p. 981. *With.* vol. iv. p. 131. *Dillw. Conf.* t. 52. *E. Bot.* t. 1552.

CONFERVA *marina pennata*, *Dillen.* t. 4. f. 23.

STYPOPODIUM *scoparium*, *Kütz. Phyc. Gen.* p. 293. t. 18. f. 2.

HAB. On submerged rocks, within and beyond the influence of the tide. Generally distributed along the coasts of the British Islands; most common in the south.

GEOGR. DISTR. Atlantic coasts of Europe from Norway to Spain. Baltic and Mediterranean Seas. Canary Islands, *Webb.* Cape of Good Hope, *W. H. H.*

DESCR. *Root*, and lower part of the stems invested with a thick coating of woolly fibres. *Stems* 2–4 inches high or more, shaggy, robust, either much and irregularly divided, or subsimple, densely set with quadrifarious, pinnate or bi-pinnate branches, which spread from the summits of the main divisions in broad, brush-like, rigid tufts. *Pinnæ* either short, simple, and spine-like or elongated, and again pinnulate. *Joints* longitudinally striate. A *section* of the stem and its accessory fibres (fig. 5), exhibits an elegant lace-work of square cellules in the centre of the stem, and of each separate fibre.

So different from each other are the summer and winter states

of this plant that the accurate Lyngbye may well be forgiven for considering them to be distinct species. Few persons on inspection of our plate, would suppose that the bushy and broom-like upper figure, was identical in species with the feathery plant represented below; even their microscopic characters are widely dissimilar. Yet, observation, the true test of species, has traced the one form into the other; and I possess a suite of specimens communicated by Miss Cutler and Mrs. Griffiths, which clearly demonstrate the transition.

*Sphacelaria scoparia* has been long known to botanists, having been noticed by Bauhin, and figured by Dillenius in his admirable work. It is very common on the several coasts of Europe, both Atlantic and Mediterranean, and probably extends to other tropical shores besides those of the Canary Islands. I have gathered it in two localities at the Cape of Good Hope. Further south, its place is taken by an analogous form (*S. funicularis*, Mont.), which is found at the Auckland Island, and in New Zealand, in which Island some other remarkable *Sphacelariæ* occur. Of these the most curious is *S. hordeacea*, whose branches are tipped with spikes of utricles, subtended by ramuli, and closely resembling miniature ears of barley. Other species of the genus inhabit every zone, from North Cape to Cape Horn; but tropical algæ have been, as yet, so imperfectly investigated, that it is premature to assert to which zone the maximum of the genus belongs. At present the evidence is in favour of the temperate zones of the northern hemisphere.

Professor Kützinger has, in his 'Phycologia Generalis,' constituted *S. scoparia* the type of a distinct genus, and *S. filicina* that of another. The grounds of such separation are, in my opinion, very insufficient to warrant the dismemberment of so natural and well defined a group as the *Sphacelariæ* of Lyngbye appear to be.

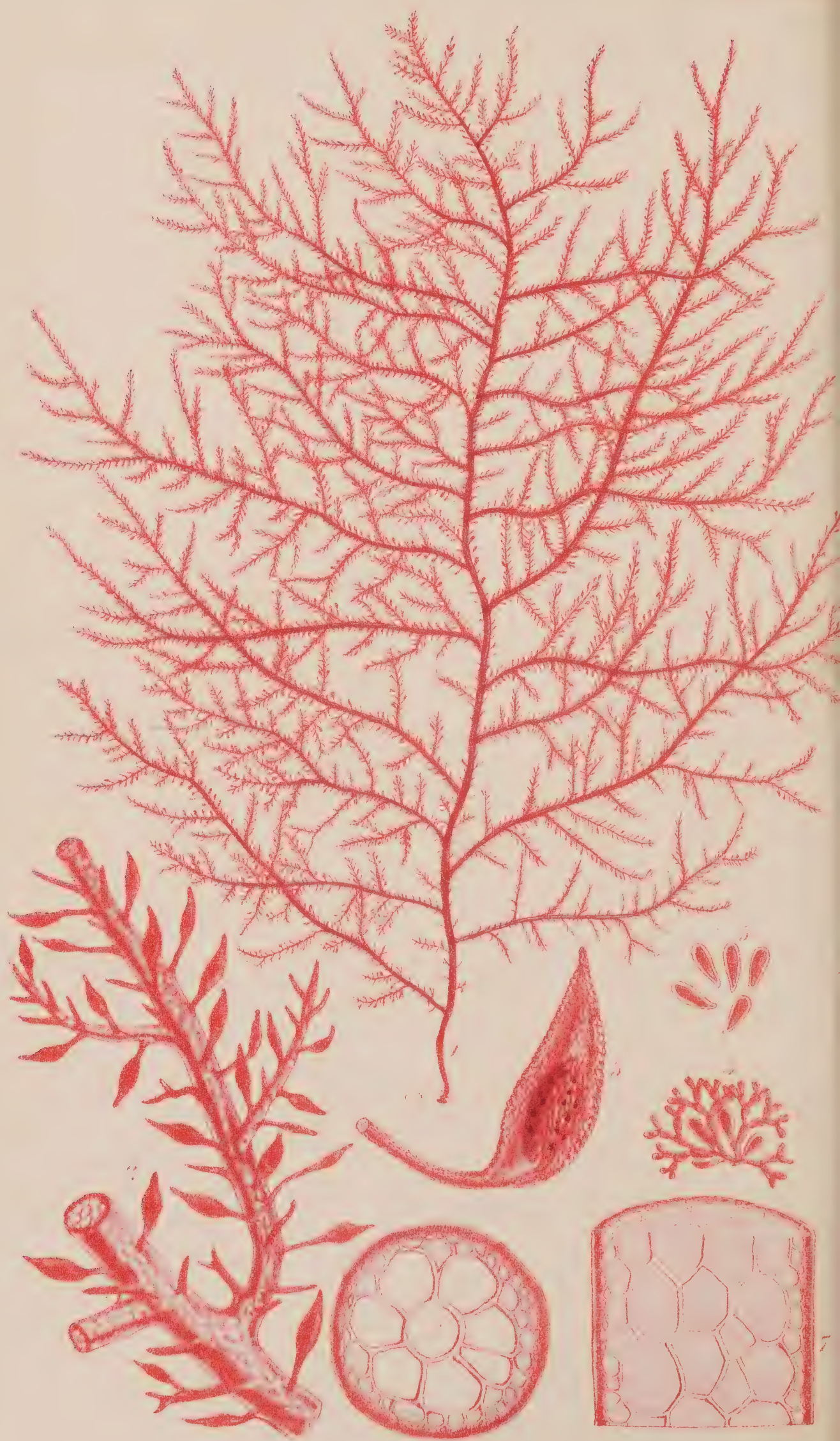
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Fig. 1. SPHACELARIA SCOPARIA; in summer:—*natural size*. 2. Branchlet of the same:—*magnified*. 3. *S. scoparia*; in winter:—*natural size*. 4. Branchlet of the same. 5. Cross section of the stem, surrounded by accessory fibres:—*magnified*.

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## PLATE XXXVIII.

NACCARIA WIGGHII, *Endl.*

GEN. CHAR. *Fronde* cylindrical or flat, filiform, solid, rose-red; central cellules large, empty; those of the surface minute. *Ramuli* composed of jointed, dichotomous, verticillate filaments. *Fructification*; groups of spores (*favellidia*) contained in swollen ramuli. NACCARIA (*Endl.*) —in honour of *F. L. Naccari*, an Italian botanist, and author of ‘*Algologia Adriatica*’, and other works.

NACCARIA *Whigghii*; frond cylindrical; branches irregular, subalternate, attenuated; ramuli spindle-shaped, quadrifarious.

NACCARIA *Wigghii*, *Endl. Gen. Pl.* no. 68. *Endl. 3rd Suppl.* p. 37. *Harv. Man.* p. 50. *J. Ag. Alg. Medit.* p. 86. *Kütz. Phyc. Gen.* p. 391.

CHÆTOSPORA *Wigghii*, *Ag. Syst.* p. 146. *Grev. Alg. Brit.* p. 153. t. 16. *Hook. Br. Fl.* vol. ii. p. 306. *Harv. in Mack. Fl. Hib.* part 3. p. 187.

FUCUS *Wigghii*, *Turn. in Lin. Trans.* vol. vi. p. 135. t. 10. *Syn. Fuc.* vol. ii. p. 362. *Hist. Fuc.* t. 102. *Sm. E. Bot.* t. 1165.

CLADOSTEPHUS *Wigghii*, *Spreng. Syst. Veg.* vol. iv. p. 347.

HAB. On marine rocks, at and beyond the extreme limit of the tides. Annual. Summer. Very rare. Yarmouth, *Mr. Lilly Wigg.* South coast of England, in several places; not unfrequent, *Mr. Borrer*, *Mrs. Griffiths*, &c. Bantry Bay, *Miss Hutchins.* Kilkee and Wicklow, *W. H. H.* Belfast Bay, *Mr. W. Thompson.* Jersey, *Miss White*, *Miss Turner.*

GEOGR. DISTR. Atlantic shores of Europe from England to Spain. Mediterranean sea, at Nice, *Risso.*

DESCR. *Root* discoid. *Fronde*s 6–12 inches high, cylindrical, filiform, much branched. Main *stem* from half a line to a line in diameter below, gradually attenuated upwards, undivided, or variously cleft, or subdichotomous, beset with very numerous, quadrifarious, lateral branches. *Branches* alternate, or issuing irregularly, very various in length, simple, or slightly divided, bearing a second or third set of similar but shorter and more slender branchlets; which, including all the younger parts of the frond, are beset on all sides with minute, slender ramuli, tapering to each end, and 1–2 lines in length. The stem and branches are solid, composed internally of very large, hyaline, polygonal, cells, surrounded by others of small size, and a periphery composed of minute cellules. The large interior cells, seen through the coat of the frond, give the surface, under a low power of the microscope, a reticulated appearance. The ramuli consist of whorls of horizontal, radiating, dichotomous, jointed filaments, closely packed together, and issuing from a slender, cellular axis. When in *fructification*, the ramuli become wider in the middle, taking a spindle shape, and *spores* of an oblong, pyriform shape, are formed at the bases of the whorled filaments. The *colour* is a brilliant, rose-red, the *substance* gelatinoso-membranaceous, and the plant adheres to paper in drying.

This charming plant, as rare as it is beautiful, was discovered

by Mr. Lilly Wigg on the Norfolk shore, about the year 1790, and first described by Mr. Dawson Turner in a paper read before the Linnæan Society in 1801. Since that period it has been detected on many different parts of the English and Irish coasts ; but not as yet, that I am aware of, in Scotland.

Some doubts respecting its true affinities have been entertained by modern systematists, but all seem now to be agreed in referring it to the neighbourhood of *Mesogloia* ; an affinity suggested by its first describer ; long neglected, and afterwards independently taken up by Mrs. Griffiths, under whose sanction I referred it in 1836 to its present position. The structure of the greater part of the frond is indeed very different from that of the *Gloiocladeæ*, the peripheric filaments which form so remarkable a feature in that family, being wholly wanting in the stem and branches ; but the habit and gelatinous substance are very similar, and the structure of the ultimate ramuli agrees very nearly with that of the whole frond of *Mesogloia*.

In the Mediterranean it appears to be of as unfrequent occurrence as on the British shores, and has only, as yet, been found by M. Risso. A second species of the genus, *N. Schousboei*, J. Ag., is found on the shores of Morocco ;—it is said to have flat, many times pinnated fronds.

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Fig. 1. *NACCARIA WIGGHII* :—*natural size*. 2. Part of a branch. 3. One of the fruiting ramuli. 4. Filaments of which this is composed, with spores *in situ*. 5. Spores removed. 6. Transverse section of the stem. 7. Longitudinal section of the same :—*all magnified*.

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## PLATE XXXIX.

ULVA LINZA, *Linn.*

GEN. CHAR. *Frond* membranaceous, green, expanded, plane (in some cases saccate when young), composed of irregular cellules. *Fructification*; *granules*, often arranged in fours, scattered over the whole frond. ULVA—supposed to be from *Ul*, *water* in Celtic.

ULVA *Linza*; frond linear lanceolate, acute, crisped at the margin, composed of two membranes closely applied.

ULVA *Linza*; *Linn. Sp. Pl.* p. 1633. *Lightf. Fl. Scot.* p. 973. *Fl. Dan.* t. 889. *Roth. Cat.* vol. ii. p. 246, and vol. iii. p. 330. *Ag. Syn.* p. 40. *Spec. Alg.* vol. i. p. 413. *Lyngb. Hyd. Dan.* p. 32. *Grev. Fl. Edin.* p. 299. *Alg. Brit.* p. 173. *Hook. Br. Fl.* vol. ii. p. 311. *Harv. in Mack. Fl. Hib.* part 3. p. 243. *Man.* p. 171. *Wyatt. Alg. Danm.* no. 164. *J. Ag. Alg. Medit.* p. 17.

SOLENTIA *Linza*, *Ag. Syst.* p. 185.

PHYCOSERIS *Linza*, *Kütz. Phyc. Gen.* p. 297.

TREMELLA *marina fasciata*, *Dill. Musc.* p. 46. t. 9. f. 6.

HAB. On rocks and stones in the sea, at half-tide level. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. New Zealand.

DESCR. *Root* a small callus. *Fronds* from six inches to one or even two feet in length, and from half an inch to two inches in width, linear-lanceolate, attenuated towards the base, and more or less tapering at the apex, waved and curling at the margin, membranaceous; composed of two distinct membranes closely applied together. *Fructification* scattered over the whole frond, to which it gives colour. *Colour*, a full, brilliant grass-green, fading in age. *Substance* thin, adhering to paper in drying.

This is one of the most beautiful of the British *Ulvæ*, as it is also one of the less common species. Its gracefully shaped, and elegantly curled fronds look peculiarly well as the plant waves freely in the water.

It has long been known to botanists, having been distinguished by Linnæus, and has been found on very distant shores. It inhabits the Southern as well as the Northern Oceans, probably extending nearly as far as vegetation extends to the south, though as yet we have not had it from any locality south of the Bay of Islands. The frond consists of a double membrane, so that it has been by some authors associated with the *Euteromorphæ*, to which group it affords a direct passage.



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Fig. 1. ULVA LINZA, tuft of fronds :—*natural size*. 2. A portion of the membrane :—*magnified*.

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## PLATE XL.

DASYA OCELLATA, *Harv.*

GEN. CHAR. *Fronde* filamentous; the *stem* and *branches* mostly opaque, irregularly cellular (rarely pellucid, longitudinally tubed), composed internally of numerous parallel tubes; the *ramuli* jointed, single-tubed. *Fructification* two-fold, on distinct plants; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores; 2, lanceolate *Pods* (*stichidia*), containing *tetraspores* ranged in transverse bands. DASYA (*Ag.*)—from *δαῖς* hairy.

DASYA *ocellata*; stems subsimple, beset on all sides with long, erecto-patent, dichotomous, pencilled ramuli; articulations three or four times longer than broad; pods linear-lanceolate, attenuated, tapering to an acute point.

DASYA *ocellata*, *Harv. in Hook. Br. Fl.* vol. ii. p. 335. *Mack. Fl. Hib.* part 3. p. 210. *Wyatt, Alg. Danm.* no. 179. *Harv. Man.* p. 97. *Kütz. Phyc. Gen.* p. 414.

DASYA *simpliciuscula*, *Ag. Sp. Alg.* vol. ii. p. 122 (1827). *J. Ag. in Linn.* vol. xv. p. 35. *Alg. Medit.* p. 118.

CERAMIUM *ocellatum*, *Gratel. in Hist. Soc. Med. Montp.* 1807. p. 34.

HUTCHINSIA *ocellata*, *Ag. Syst.* p. 157 (1824).

HAB. On mud-covered rocks in the sea, rare. Annual. Summer. Abundant on the Pier, Torquay, *Mrs. Griffiths*. Whitsand Bay, *Dr. Walker Arnott*. Wicklow, *W. H. H.* Smerwich Harbour, Kerry, *Mr. W. Andrews*. Balbriggan, *Mrs. Gregg* and *Miss Gower*. Trevol, *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea. South of England. East and South of Ireland.

DESCR. *Root* a small disc. *Fronde*s one, two, or three inches high, tufted. *Stems*, in the smaller specimens, simple or once forked at the base; in the larger, twice or thrice forked, and occasionally having a few lateral, simple branches; as thick as hog's bristle, opaque, cartilaginous, without external joints, the surface cellules being irregular. *Ramuli* clothing the stem and branches from the base to the apex, at which point they are remarkably dense, inserted quadrifariouly, 3–5 lines long, slender, erect, several times forked near their base, cylindrical, the apices much produced, but not tapering, blunt. *Articulations* of the ramuli 3–4 times longer than broad, single-tubed. *Fructification*; *Ceramidia* (not yet found on British specimens). *Stichidia* or *Pods* shortly pedicellate, borne on the ramuli, narrow, lanceolate, gradually tapering from the middle to an acute apex, straight or gracefully curved, slightly constricted at close intervals, producing in transverse bands, numerous small dark-purple tetraspores. *Colour* a brownish or a bright purple. *Substance* membranaceous, adhering to paper.

This little plant here figured, was first described by Grateloup, in the year 1807, under the specific name which I adopt in preference to that proposed by Agardh twenty years subsequently. By the term *ocellatum*, Grateloup no doubt intended to allude to the eye-like spots caused by the density of the ramuli at the tips of the branches. The branches, indeed, when the plant is displayed on paper resemble delicate feathers, each marked with an eyelet. When growing, Mrs. Griffiths compares them with equal propriety, to the brushes with which bottles are cleaned

*Dasya ocellata* was added to the British Flora by Mrs. Griffiths, who found it plentifully fringing the base of the small harbour-pier at Torquay, in which situation it is constantly covered with mud, from which obscurity, a less zealous and acute observer, would not have redeemed it. It can only be approached in a boat, at extreme low water. In this situation it has continued to grow for several years. Of recent date it has been discovered in two or three Irish localities, at either side of the kingdom. From one of these, Balbriggan, the specimen here represented, and which I owe to the kindness of Miss Gower, was procured. It is of the largest size that I have seen, the majority of British individuals being not above an inch and a half in length, and either quite simple or scarcely branched.

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Fig. 1. *DASYA OCELLATA*; a tuft:—*natural size*. 2. Portion of a branch  
3. Ramulus with pods; *both magnified*.

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the name here quoted. I am not aware whether it has been published by Chauvin. It is nearly related in structure to *M. strangulans* but differs something in habit, forming a much larger and thinner spot on the fucus.

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A. Fig. 1. Portion of the frond of *Rhodymenia palmata* with *Myrionema Leclancherii* growing upon it:—*natural size*. 2. *Myrionema Leclancherii*. 3. Portion of the same. 4. Filaments from the same. 5. Filaments and spores *in situ*:—*all more or less magnified*.

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## PLATE XLI. (B).

### MYRIONEMA PUNCTIFORME, Harv.

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MYRIONEMA *punctiforme*; patches globose; filaments tapering to the base; spores linear-obovate, affixed to the vertical filaments near their base.

MYRIONEMA *punctiforme*, Harv. in Hook. Br. Fl. vol. ii. p. 391. Man. p. 124.

LINKIA *punctiformis*, Lyngb. Hyd. Dan. t. 66. Carm. Alg. App. ined. cum icone.

HAB. Parasitical on the Florideæ. Annual. Summer and Autumn On *Chrysomenia clavellosa*, at Appin, Capt. Carmichael. On *Ceramium rubrum*, at Torquay, Mrs. Griffiths.

GEOGR. DISTR. Shores of Europe.

DESCR. Fronds or patches very minute, half a line or less in diameter, flattish or globose, composed of vertical threads radiating from a small base. Filaments slightly tapering to the base, with joints twice or thrice as long as broad. Spores sessile near the bases of the erect filaments, very narrow in proportion to their length, and much attenuated at the base.

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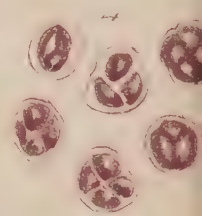
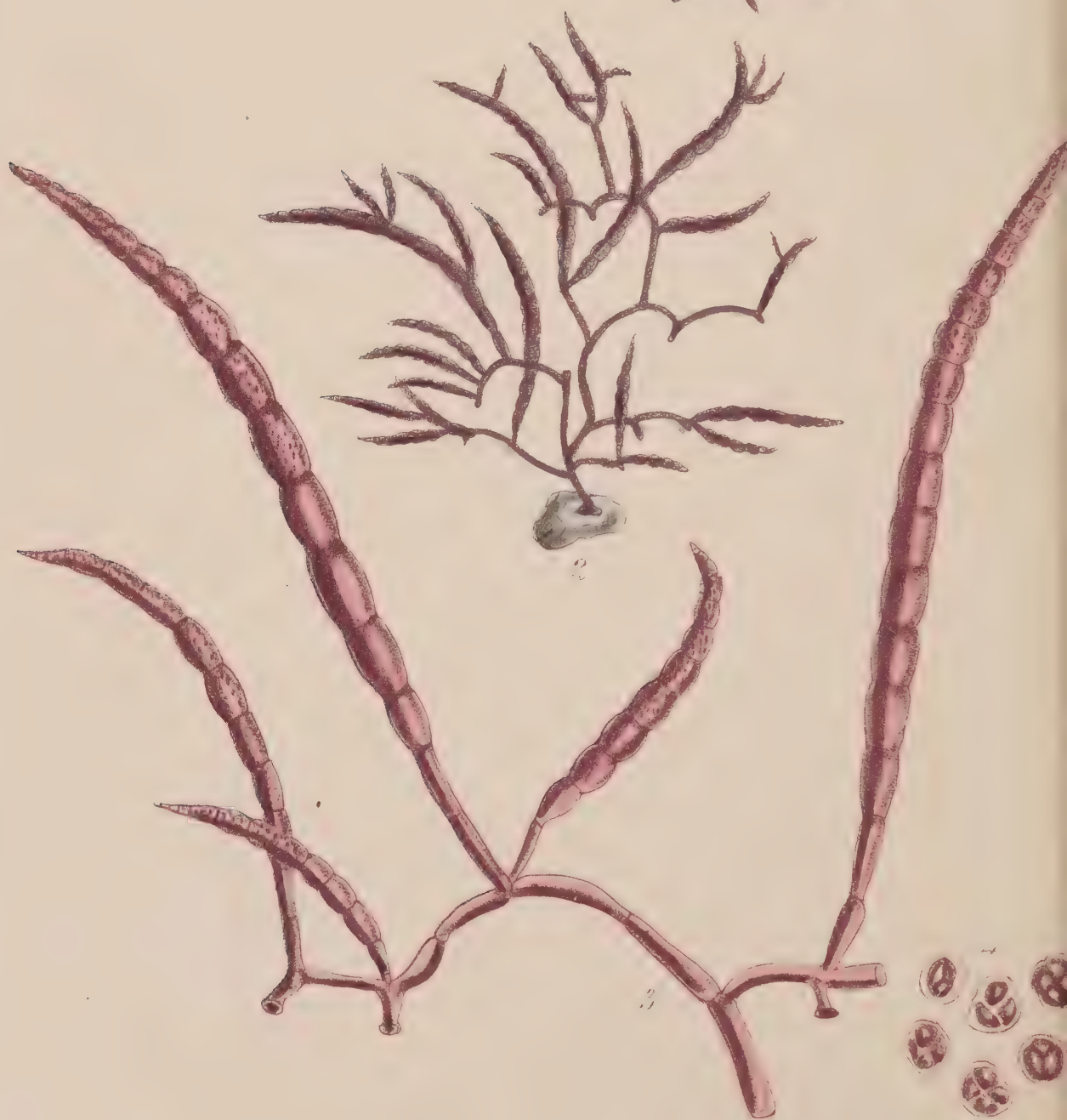
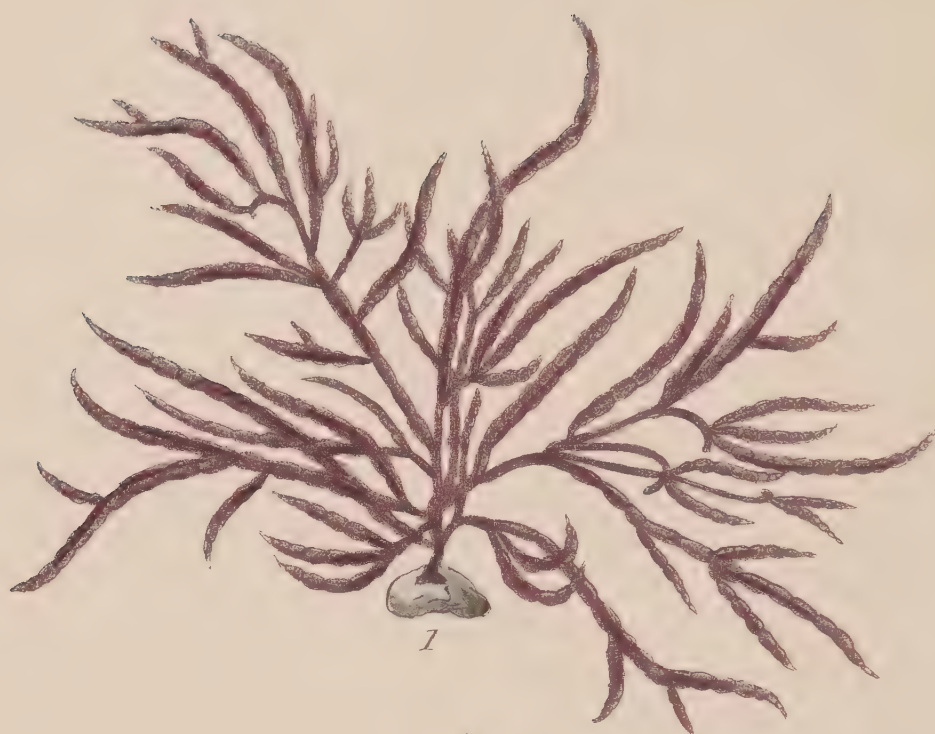
This little parasite is obviously nearly akin to *M. Leclancherii*, from which its globose fronds or patches, and more narrow spores distinguish it. It comes nearer to *M. strangulans*, but differs in the position of the spores. The only specimens which I have seen were collected by Mrs. Griffiths several years ago. They were found on *Ceramium rubrum*, which they covered nearly as closely as the warts of fructification cover *Stilophora rhizodes*. Probably, if looked after, it may be found on many of our coasts. It was added to the British Flora by the late Capt. Carmichael, of Appin, whose many discoveries in minute botany have rendered his name familiar to most algologists.

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B. Fig. 1. *Ceramium rubrum* with *Myrionema punctiforme* parasitical upon it:—*natural size*. 2. Branch of the same. 3. Vertical section of part of the *Myrionema*. 4. Filaments with spores. 5. A Spore:—*all more or less highly magnified*.

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## PLATE XLII.

CHYLOCLADIA REFLEXA, *Lenorm.*

GEN. CHAR. *Frond* tubular, constricted at regular intervals, and divided by internal diaphragms into joints, filled with watery juice, and traversed by a few longitudinal filaments; *periphery* composed of small, polygonal cellules. *Fructification* of two kinds, on distinct individuals; 1, spherical, ovate, or conical *capsules* (*ceramidia*) containing a tuft of wedge-shaped seeds, on a central placenta. 2, tripartite *tetraspores*, immersed in the smaller branches near their apices. CHYLOCLADIA (*Grev.*)—from *χυλός*, *juice*, and *κλάδος*, a *branch*.

CHYLOCLADIA *reflexa*; frond membranaceous, purple; lower branches cylindrical, slender, arched, attaching themselves by short ramuli tipped with discs; secondary branches simple, mostly secund, moniliform, spindle-shaped; ramuli few, scattered, patent or recurved.

CHYLOCLADIA *reflexa*, *Lenorm. Desm. Pl. Crypt.* no. 865.

LOMENTARIA *reflexa*, *Chauv. Alg. de Norm.*

LOMENTARIA *pygmæa*, *Duby. Bot. Gal. (excl. Syn.)*

HAB. On rocks in the sea near low-water mark. Annual. Summer. Very rare. Hagington near Ilfracombe, *Miss Amelia Griffiths*, (July 1834). Roundstone Bay, *Mr. McCalla*.

GEOGR. DISTR. Coast of Normandy. North coast of Devon.

DESCR. *Root* an expanded, fleshy disc. *Frond* from two to three inches high, half a line to a line in diameter, branching from the base in an irregular manner; the lower or main branches cylindrical, scarcely constricted, slender, arched, zigzag, forming successive arcs in one direction, and furnished at the concave side of the arc with short holdfasts, tipped with discs, by means of which the frond attaches itself to neighbouring objects, in a creeping manner; the upper or secondary branches springing from the arched ones, either two or three from one point or solitary, generally unilateral, simple, spindle-shaped, moniliform, constricted at regular intervals into joints about once and a half as long as broad, the upper joints gradually shorter to the tips. *Ramuli* few, short and mostly secund, patent or recurved, sometimes but rarely binate. *Capsules* spherical, with a pellucid border, containing a very dense mass of angular seeds. *Tetraspores* abundantly produced in the tips of the branches and ramuli. *Colour* a dull purple. *Substance* membranaceous, adhering to paper.

A small specimen of this interesting plant was communicated to me by Mrs. Griffiths some years ago, under the impression that it was a new species; but I delayed to describe it until

more numerous specimens, and in a more perfect state, should be discovered. I was not then aware that it was the same as a plant which occurs in several places on the coast of Normandy, and of which specimens have been since published in Desmaziere's *Cryptogames of France*. More lately, Mrs. Griffiths has allowed me to take a figure from specimens preserved in her Herbarium, found by Miss Amelia Griffiths at Ilfracombe; in which situation it appears to be of great rarity.

At the time the figure was made, I was not aware that a specimen found by Mr. Mc'Calla in 1840 existed in Dr. Coulter's Herbarium, among the numerous examples of *C. Kaliformis*, which I the more regret as an earlier knowledge of it would have enabled me to introduce the capsular fruit into my plate. It is abundantly covered with *capsules*, which have not been found on any of the Ilfracombe specimens.

As a species, it is, perhaps, more nearly allied to *C. Kaliformis* than to *C. parvula*, although at first sight it looks more like the latter. Its slender, main branches, and the remarkable disk-like processes by which they attach themselves at intervals, taken with the small size, irregular branching, and less gelatinous nature, offer its best distinguishing marks. The different form of the capsules affords alone a sufficient character to separate it from *C. parvula*.

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Figs. 1, 2. *CHYLOCLADIA REFLEXA*:—*natural size*. 3. Part of the stem, with branches, and *disks*. 4. Tetraspores:—*both magnified*.

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## PLATE XLIII.

ENTEROMORPHA ERECTA, *Hook.*

GEN. CHAR. *Frond* tubular, membranaceous, of a green colour and reticulated structure. *Fructification*; granules, commonly in fours, contained in the cellules of the frond. ENTEROMORPHA—from *έντερον*, an *entrail*, and *μορφή*, *form*, or *appearance*.

ENTEROMORPHA *erecta*; frond cylindrical, filiform, slender; branches erect, opposite or alternate, all attenuated to a fine point; ramuli capillary, erecto-patent; reticulations rectangular, nearly square, arranged in many longitudinal lines.

ENTEROMORPHA *erecta*, *Hook. Br. Fl.* vol. ii. p. 314. *Wyatt. Alg. Danm.* no. 166. *Harv. Man.* p. 175.

ENTEROMORPHA *clathrata*,  $\beta$ . *erecta*, *Grev. Alg. Brit.* p. 181. *Harv. in Mack. Fl. Hib.* part 3. p. 242.

SCYTOSIPHON *erectus*, *Lyngb. Hyd. Dan.* p. 65. t. 15.

FISTULARIA *erecta*, *Grev. Fl. Edin.* p. 300.

SOLENTIA *clathrata*, var. *confervoidea*, *Ag. Syst. Alg.* p. 187.

HAB. On rocks in the sea, and in rocky submarine pools, at about half-tide level; also dredged in 4–6 fathom water. Annual. Spring and Summer. Not uncommon.

GEOGR. DISTR. The temperate and tropical zones of both hemispheres.

DESCR. *Frond* from four to eight inches in height, cylindrical, varying from the thickness of a hog's bristle to half a line or a line in diameter. *Stem* usually undivided, tapering at the base and apex to a fine point, closely set throughout the greater part of its length with opposite or alternate, simple, erect or erecto-patent branches, the lowermost of which are longest, the upper gradually diminishing towards the upper part of the frond, all of them attenuated, like the stem, to an exceedingly fine point. The branches are well furnished with slender, subdistichous or irregularly quadrifarious, setaceous, short ramuli, and have a beautifully feathery appearance. The *structure* consists of a delicate membrane, composed of square or oblong-rectangular cells, each containing a dense endochrome, which in a state of fruit separates into about four distinct granules. *Colour* a brilliant grass-green. *Substance* glossy, tender, and adhering to paper in drying.

I have cautiously confined myself in making the above description to the typical variety of this variable plant, a specimen of which, communicated by Mrs. Griffiths, is represented in our plate. In the "*Manual*" I have recorded my agreement in opinion with Dr. Greville, Sir Wm. Hooker, and, indeed, with the



majority of botanists, that the several forms called *E. erecta*, *E. clathrata*, and *E. ramulosa* are but different states of one species ; and may now add that *E. Linkiana*, of Greville, and *E. Hopkirkii*, Mc'Calla, are, in my judgment, equally doubtful. Still, as the plants which have received these names present very different aspects, and from their size cannot be presented in the same plate, it is my intention to give separate figures and descriptions of all of them, and then to leave it to the judgment of botanists whether to adopt the notion of one *protean* species, or of many less variable, but still *anastomosing* species, or, more properly, *races*.

*E. erecta* is one of the most beautiful forms, particularly when dredged in deeper water than comes within the usual tide range. Such are the specimens represented in our plate, which were dredged in Torbay. In these the ramuli are even more feathery than the figure exhibits.

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Fig. 1. ENTEROMORPHA ERECTA :—*natural size*. 2. A branch :—*magnified*.  
3. Portion of the membrane :—*highly magnified*.

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## PLATE XLIV.

PLOCAMIUM COCCINEUM, *Lyngb.*

GEN. CHAR. *Root* fibrous. *Fron*d pinky-red, linear, compressed or flat, ribless, or faintly nerved, cellular, distichously much branched; the ramuli alternate, or secund, acute. *Fructification* of two kinds on distinct individuals; 1, spherical *tubercles* (*coccidia*) sessile or stalked, marginal or axillary, containing a globular mass of angular spores; 2, lateral or axillary, simple or branched *Pods* (*stichidia*) containing a double or single row of transversely parted, oblong *tetraspores*. PLOCAMIUM (*Lamour. ref.*),—from *πλόκαμος*, *braided hair*.

PLOCAMIUM *coccineum*; frond narrow, cartilaginous, plano-compressed; branches irregularly alternate, patent; ramuli subulate, secund, three or four consecutively, pectinate on their inner edges; tubercles lateral, sessile; stichidia scattered, lanceolate, simple or branched.

PLOCAMIUM *coccineum*, *Lyngb. Hyd. Dan.* p. 39. t. 9. *Grev. Alg. Brit.* p. 98. t. xii. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Wyatt, Alg. Danm.* no. 20. *Harv. Man.* p. 65. *Ag. Alg. Medit.* p. 155. *Endl. 3rd Suppl.* p. 52. *Kütz. Phyc. Gen.* p. 449. t. 64. *Mont. Pl. Cel. Canar.* p. 152. *Hook. fil. Fl. Antarct.* vol. i. p. 186.

PLOCAMIUM *vulgare*, *Lamour. Ess.* p. 50. *Gail. Dict. Sc. Nat.* vol. liii. p. 368.

PLOCAMIUM *Lyngbyanum*, *Kütz. l. c.* p. 450.

PLOCAMIUM *Binderianum*, *Kütz. l. c.* p. 450.

DELESSERIA *coccinea*, *Ag. Syn.* p. xiv. *Hook. Fl. Scot.* part 2. p. 101. *Grev. Fl. Edin.* p. 294.

DELESSERIA *Plocamium*, *Ag. Sp. Alg.* vol. i. p. 180. *Syst.* p. 250. *Mart. Fl. Brazil.* p. 42.

CERAMIUM *Plocamium*, *Roth. Fl. Germ.* vol. iii. p. 458. *Cat. Bot.* vol. ii. p. 161, and vol. iii. p. 107.

FUCUS *coccineus*, *Huds. Fl. Ang.* p. 586. *Linn. Trans.* vol. iii. p. 187. *Stack. Ner. Brit.* p. 106. *Turn. Syn.* vol. ii. p. 291. *Hist.* t. 59. *E. Bot.* t. 1242.

FUCUS *Plocamium*, *Gm. Hist.* p. 153. t. 16. f. 1. *Lightf. Fl. Scot.* vol. ii. p. 957. *Esper. Ic.* vol. i. p. 18. t. 2.

β, *uncinata*; small, slender, very flexuous, entangled and irregularly branched; ramuli patent or frequently hooked back.

PLOCAMIUM *fenestratum*, *Kütz. Phyc. Gen.* p. 450.

HAB. On submarine rocks and the larger Algæ, generally growing beyond the usual tide-level. Perennial. Summer and Autumn. Common on the British shores.

GEOGR. DISTR. Abundant in the northern and southern temperate zones. Brazil, *Martius*. Cape Horn, *Dr. Hooker*. Auckland Island; New Zealand; Tasmania. Cape of Good Hope.



DESCR. *Root* consisting of branching fibres, matted together. *Fronds* tufted 2–12 inches long, exceedingly branched, and bushy, compressed or nearly flat, two-edged, narrow, linear, irregularly divided; main stems from half a line to nearly a line in breadth, alternating or subdichotomously branched; branches distichous, frequent, often secund, patent, bearing one or more sets of similar lesser branches. *Ramuli* subulate, acute, patent, fringing the edges of the branches, secund, three or four at one side, and then three or four at the other; the lowest in position of each set simple, rarely crenulate along its outer edge, the rest pectinate along their inner edge with subulate teeth, which, in luxuriant specimens, bear a second or third series. *Tubercles* solitary, sessile on the edges of the stem and branches. *Stichidia* lanceolate or dichotomous, scattered along the edges of the upper branches, occasionally tufted, containing several oblong *tetraspores*, each marked by three pellucid transverse lines or zones, and finally separating into four granules. *Colour* a fine transparent red, between crimson and scarlet. *Substance* cartilagineo-membranaceous, adhering, but not very closely, to paper.

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A well-known, abundant, and beautiful species, and an especial favourite with amateur weed-collectors, and manufacturers of sea-weed pictures. It is also a very widely dispersed plant, being found in greater or less abundance and luxuriance, but with the same essential characters, in all waters from the North Cape to Cape Horn, in which last mentioned locality Dr. Hooker gathered specimens, in every respect identical with our most strongly growing British individuals.

With the exception of this *pelagic* species, the genus *Plocamium*, in which I include the *Thamnophora* of Agardh, and the *Thamnocarpus* of Kützing (not of Harv. in Hook. Ic. Plant.) is confined to the Southern Ocean, where many very distinct species are found, some of which are of large size, having brilliant crimson or rose-red fronds from a quarter to half an inch in breadth, and elegantly pectinato-pinnate. To all, the alternate, or secund, acute ramuli are common; the only variation being that in some they are deltoid, in others subulate, and in some secund *in pairs*, in others (as in our *P. coccineum*) secund *in fours*. In one remarkable one, *P. Hookeri*, Harv., a native of Kerguelen's Land, the branches bear, in addition to the subulate ramuli, occasional expanded, leaf-like processes.

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Fig. 1. *PLOCAMIUM COCCINEUM*:—*natural size*. 2. Portion of a branch.  
 3. Branchlet with a *tubercle*. 4. *Tubercle*. 5. Spores from the same.  
 6. Branchlet with *stichidia*. 7. A *stichidium*. 8. *Tetraspores*, transversely parted.

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## PLATE XLV.

LAMINARIA FASCIA, *Ag.*

GEN. CHAR. *Fronde* stipitate, coriaceous or membranaceous, flat, undivided or irregularly cleft, ribless. *Fructification*; cloudy spots of spores, imbedded in the thickened substance of some part of the frond. LAMINARIA (*Lamour.*)—from *lamina*, a thin plate, in allusion to the flat frond.

LAMINARIA *fascia*, *Ag.*; stem very short, setaceous, gradually expanding into a membranaceous, broadly-oblong, wedge-shaped, lanceolate, or linear frond.

LAMINARIA *fascia*, *Ag. Syn.* p. xix. *Ag. Sp. Alg.* vol. i. p. 122. *Syst.* p. 273. *Wyatt. Alg. Danm.* no. 157. *Harv. Man.* p. 25. *E. Bot. Suppl.* t. 2845. *Hook. fil. Fl. Ant. ined.* *Endl. 3rd Suppl.* p. 27.

LAMINARIA *debilis*, *Ag. Spec.* vol. i. p. 120. *Syst.* p. 273. *Grev. Crypt.* t. 277. *Grev. Alg. Brit.* p. 35. t. v. *Hook. Br. Fl.* vol. ii. p. 272. *Harv. Man.* p. 25. *Endl. 3rd Suppl.* p. 27.

LAMINARIA *cuneata*, *Suhr.*

LAMINARIA *papyrina*, *Bory. in Dict. Class d'Hist. Nat.* vol. ix. p. 189.

FUCUS *fascia*, *Fl. Dan.* t. 768. *Turn. Syn.* vol. i. p. 186. *Roth. Cat. Bot.* vol. ii. p. 161.

HAB. On sand-covered submarine rocks and stones in the sea, near low-water mark. Annual. Summer. North of Ireland, *Mr. R. Brown*, (*Turner*). Carrickfergus, *Mr. Templeton*. Western Islands of Scotland, *Mr. Chalmers*. Larne, *Dr. Drummond*. Antrim coast, *Mr. D. Moore*. Sidmouth and Torquay, *Mrs. Griffiths*. Mounts Bay and Salcombe, *Mr. Ralfs*. Malahide, *Mr. Mc'Calla*. Saltcoats, *Rev. D. Landsborough*.

GEOGR. DISTR. Atlantic shores of Europe from Norway to Spain. Mediterranean Sea, *C. Agardh*. Falkland Islands, *Lyall*.

DESCR. *Root* a small disc. *Stem* as thick as hog's bristle, one to four lines in length, cylindrical at the base, compressed in its upper half, and gradually widening into the cuneate base of the frond. *Fronde* very variable in form, two to twelve inches long, and from a quarter of an inch to an inch and a half, or two inches, in breadth, sometimes abruptly cuneate at base, sometimes much attenuated, either lanceolate, oblong or linear, or oblong-ovate; in some cases remarkably obtuse, in others tapering to a more or less acute point, or rarely somewhat lobed at the apex, waved or flat at the margin, membranaceous, smooth, rather glossy. *Colour* varying from a greenish to a brownish olive, sometimes bright, sometimes very dingy. *Fruit* unknown. *Cellules* of the interior of the frond narrow-oblong, twelve-sided, pellucid; those of the surface very minute, arranged in areoli, four cellules in each areolus.

The first notice of this species occurs in the '*Flora Danica*,'

in which work a figure is given which coincides in most characters with the narrower and browner of our figures, and on which is grounded the *idea* of the *Laminaria fascia* of Agardh, and succeeding authors. In Greville's '*Scottish Crypt. Flora*' another figure, resembling our broadest form, is represented under the name of *Laminaria debilis*, a name first proposed by Agardh for specimens sent to him from the coast of Spain. At first sight these forms appear to be abundantly distinct, the long strap-shape of one contrasting with the broadly ovate form of the other. But the slight importance to be attached to such variations becomes at once evident to any observer who collects the plant in any quantity, on its native rock, and to whom specimens ranging from the broadest to the narrowest, occur in the same locality. From a very extensive suite of specimens from several parts of the coast, and of all shapes and sizes I have selected a few for illustration, in which a gradation of form is well shewn from the broad, abruptly stipitate *L. debilis* to the ribbon-like *L. fascia*. In uniting these under one specific head, I, of course, preserve the trivial name which was first proposed.

Specimens gathered at the Falkland Islands, by Dr. Lyall, are identical with some of the British varieties; and with the *L. cuneata*, of Suhr, which is obviously a transition plant, having a broadish frond, with a long cuneate base.

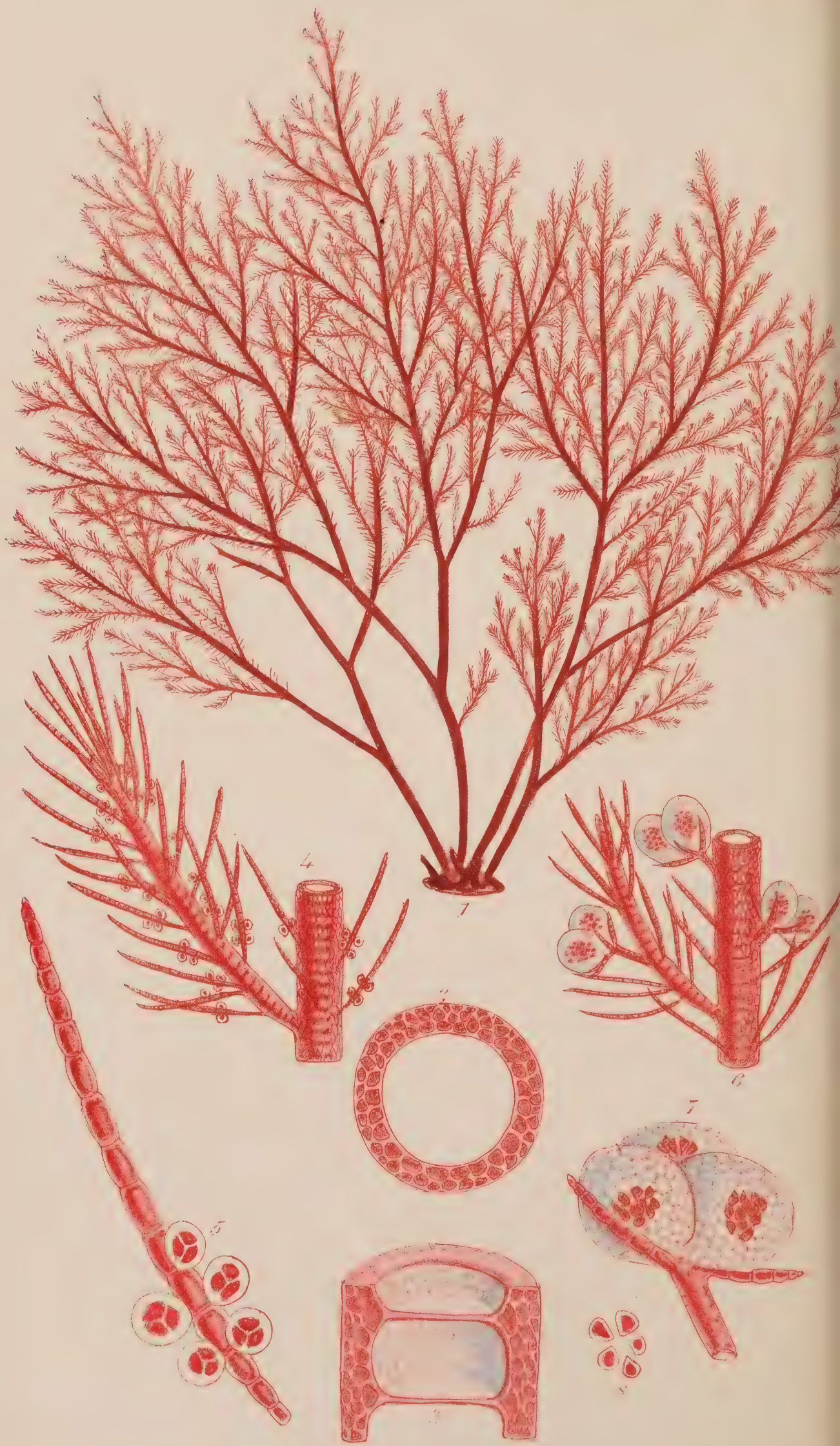
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Fig. 1. LAMINARIA FASCIA, different varieties:—*natural size*. 2. Part of the frond:—*magnified*, to shew the surface cellules. 3. Section of the same, showing the internal structure.

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## PLATE XLVI.

SPYRIDIA FILAMENTOSA, *Harv.*

GEN. CHAR. *Frond* filiform, cylindrical, much branched, traversed by a wide articulated tube, whose walls are composed of small, angular cells; *ramuli* setiform, simple, jointed. *Fructification* of two kinds on distinct individuals; 1, external *tetraspores*, with colourless borders, attached to the ramuli; 2, stalked, gelatinous, lobed *receptacles* (*favellæ*), involucred by short ramuli, and containing two or three distinct masses of roundish spores. SPYRIDIA (*Harv.*)—from *σπυρίς*, a basket.

SPYRIDIA *filamentosa*; frond irregularly branched, subopake; branches tapering at the base, more or less densely clothed with setaceous ramuli; joints of the stem very short, of the ramuli once and a half as long as broad.

SPYRIDIA *filamentosa*, *Harv. in Hook. Br. Fl.* vol. ii. p. 337. *Wyatt, Alg. Danm.* no. 88. *Harv. Man.* p. 101. *J. Ag. Alg. Medit.* p. 79. *Endl. 3rd. Suppl.* p. 35. *Kütz. Phyc. Gen.* p. 376. t. 48. *Mont. Pl. Cell. Canar.* p. 174.

SPYRIDIA *crassiuscula*, *Kütz. Phyc. Gen.* p. 376.

SPYRIDIA *setacea*, *Kütz. l. c.*

SPYRIDIA *nudiuscula*, *Kütz. l. c.*

FUCUS *filamentosus*, *Wulf. Cr. Aq.* p. 64.

FUCUS *friabilis*, *Clem. Ess.* p. 318.

CERAMIMUM *filamentosum*, *Ag. Sp. Alg.* vol. ii. p. 141.

HUTCHINSIA *filamentosa*, *Ag. Syst.* p. 159.

CONFERVA *Griffithsiana*, *E. Bot.* t. 2312.

HAB. On submarine rocks, near low-water mark. Perennial, Summer. Southern coasts of England, in several places; but rare. Southampton, *Miss Biddulph*. Torquay and Sidmouth, *Mrs. Griffiths*. Jersey, *Miss White*; *Miss Turner*. Aberfraw, Anglesea, plentiful; and Holyhead, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic coasts of Europe from England to Spain. Abundant in the Mediterranean. East and West Indies. Canary Islands. Australia and Tasmania.

DESCR. *Root* a large disc-like expansion, half an inch or more in diameter. *Stems* tufted, many springing from the same base, from two to ten inches high, about half a line in diameter below, gradually attenuated upwards irregularly branched in a manner between dichotomous and alternate. In some specimens, an undivided stem, six to eight inches long, is densely beset with lateral branches spreading nearly horizontally, and diminishing in length as they approach the apex; the lowest being three to four inches

long, giving the frond an ovate outline, and bearing a second or third series of lesser branches. In others, the main stem is once or twice forked, and clothed throughout with short lateral branches of nearly the uniform length of an inch; and in others (as represented in our figure), the stem is irregularly forked, the lateral branches more erect, simple or divided, more or less fastigiate, and the general outline of the tufts roundish. In all varieties the younger portions of the fronds are beset with more or less dense, hair-like, jointed ramuli about two lines in length, and issuing without order from all sides of the branch. Occasionally these are very few and the plant becomes *S. nudiuscula*, of Kützing. *Tube* occupying two thirds of the breadth of the stem, divided into joints by transverse diaphragms, placed at short intervals; its walls cellular, and the external surface reticulated. *Tetraspores* elliptical, clustered round the bases of the ramuli. *Favellæ* bi-lobed, or rarely tri-lobed. *Colour* a dull red, very frequently faded, and yellowish white. *Substance*, of the stem cartilaginous, of the ramuli membranaceous.

This plant, which is very local on the British coasts, although found in considerable plenty in a few places, is interesting in a geographical view, being a native of warm latitudes which reaches to its northern limit in this country. Until very recently that Mr. Ralfs discovered it on the Welsh coast, it had only been found in Britain on the extreme southern shores. It is more plentiful in the Channel Islands, and along the French coast, and abounds in the Mediterranean; but the finest specimens are found in the Tropical ocean. In Britain it is very generally much discoloured, being of a dirty grey or brownish cast, a deformity caused by its growing in comparatively shallow water, and in places exposed to strong sunshine.

A plant so widely dispersed is, as might reasonably be supposed, subject to some variations of character, on which Kützing has proposed to found several distinct species. In the detailed description I have noticed some of these variations, which do not appear to me to be of specific value; and in a very extensive series of specimens from different localities I find innumerable intermediate forms. The most distinct looking variety, (and it may, perhaps, be admitted as a species) is found in Tasmania, and has the ramuli pretty constantly whorled, and much denser than usual.

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Fig. 1. SPYRIDIA FILAMENTOSA:—*natural size*. 2. A transverse section of the stem. 3. Longitudinal semi-section of the same, 4. Branchlet with its ramuli, bearing tetraspores. 5. Ramulus with *tetraspores*. 6. Branchlet bearing *favellæ*. 7. A *favella*. 8. Spores from the same:—*all more or less magnified*.

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## PLATE XLVII.

FUCUS SERRATUS, *Linn.*

GEN. CHAR. *Fron*d linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air-vessels*, when present, innate, simple. *Receptacles* either terminal, or lateral, filled with mucus traversed by a network of jointed fibres, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L*), φῦκος, a seaweed.

FUCUS *serratus*; frond plane, dichotomous, mid-ribbed, serrated, without air-vessels; receptacles flat, terminating the branches, serrated.

FUCUS *serratus*, *Linn. Sp. Pl.* p. 1626. *Fl. Lap.* p. 365. *Fl. Suec.* p. 430. *Huds. Fl. Ang.* p. 576. *Lightf. Fl. Scot.* vol. ii. p. 902. *Stack. Ner. Brit.* p. 2. t. 1. *Turn. Syn.* vol. i. p. 110. *Hist.* t. 90. *E. Bot.* t. 1221. *Lyngb. Hyd.* p. 5. t. 1. *Ag. Sp. Alg.* vol. i. p. 95. *Syst.* p. 278. *Hook Fl. Scot.* part 2. p. 95. *Grev. Fl. Edin.* p. 284. *Alg. Brit.* p. 15. *Hook. Br. Fl.* vol. ii. p. 267. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Wyatt, Alg. Danm.* no. 2. *Endl.* 3. *Suppl.* p. 29. *Kütz. Phyc. Gen.* p. 352.

HAB. On rocky sea shores, clothing the rocks at half-tide level. Perennial. Winter and Spring. Very common.

GEOGR. DISTR. Atlantic coasts of Europe from Norway to Spain. Baltic Sea. Greenland, *Lyngb.* Coast of Piedmont, *Allioni* (doubtful).

DESCR. *Root* a hard, conical disc. *Fron*d from two to six feet long, and from half an inch to two inches in breadth, linear, traversed by a strong, thick mid-rib, regularly dichotomous, the margin sharply serrated, or occasionally lacinated. *Mid-rib* thickened at the forking. *Vesicles* none. *Receptacles* flat, terminating the branches, of which they are merely prolongations, slightly altered in structure, and containing numerous immersed *conceptacles* communicating with external pores. These *conceptacles* are spherical, hollow, and seem to be formed by an inflexion of the periphery of the frond. In some individuals they produce from all parts of their inner surface, numerous obovate spores, which finally separate into eight distinct sporules, and are surrounded by filamentous processes. In other individuals the place of the spores is occupied by tufts of much-branched, jointed filaments, which produce an abundance of elliptical cellules, filled with numerous, bright-orange, vivaceous corpuscles or *zoospores*, which eventually issue from their cases and swim about, with a rapid motion, resembling the voluntary movement of animalcules. These *cellules* are called *antheridia*, and their contained *zoospores* supposed to fulfil the office of pollen. They are never found on the same plant as the spores, the species being strictly diœcious.

*Fucus serratus* abounds on all the Atlantic shores of Europe, and probably extends to the eastern shores of America, but is not found, according to J. Agardh, in the Mediterranean Sea, although



mentioned by Allioni. It does not appear to extend to the Pacific, nor to be found in the Southern Ocean.

It presents some varieties, chiefly distinguished by the greater or less breadth of the frond, and the depth of the serratures. I have chosen one of the most common states for illustration. In the variety *integerrimus* of Turner, the marginal serratures are very shallow, and sometimes obsolete, but always sufficiently marked to prevent the species being mistaken. In his variety *latifolius*, the upper branches are very much wider than the lower, sometimes more than two inches broad, and remarkably rounded, not unlike the webbed feet of some waterfowl; and in Greville's variety *laciniatus*, the serratures are very deeply cut, "and cleft or laciniate."

Messrs. Decaisne and Thuret, who first discovered the zoospores above described, of which they have given a most interesting account in the 'Annales des Sciences Naturelles', divide the Agardhian genus *Fucus* into several genera, of which *F. serratus*, *F. nodosus*, *F. canaliculatus*, and *F. tuberculatus* respectively are the types, and which they distinguish chiefly by the spores containing eight, four, two, or one sporules; a minute character which accompanies some differences in natural habit, and might be resorted to were the genus *Fucus* of great extent. But in so small a genus it appears scarcely necessary to burden the science with so many new names.

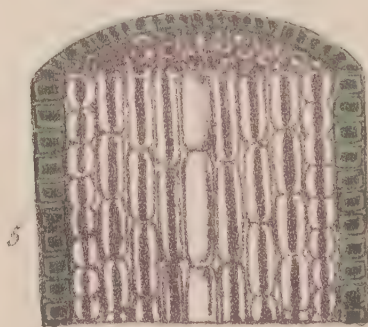
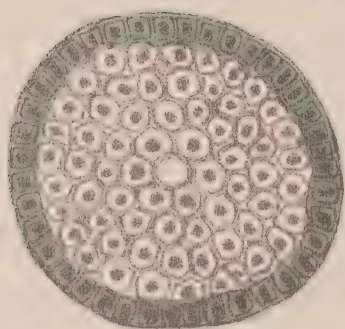
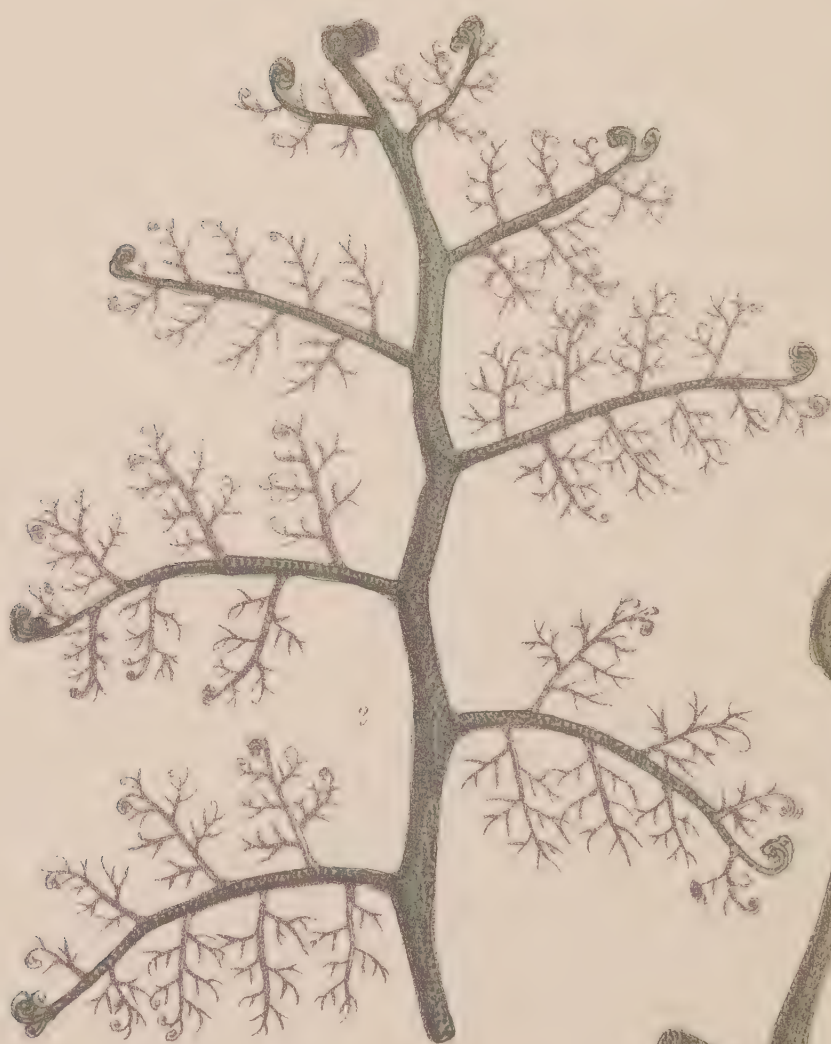
To observe the *zoospores* in motion, fresh specimens, collected in winter or early spring, having orange-coloured receptacles, should be removed from the water, and left to dry partially. As the surface dries, there will exude from the pores of the receptacle, drops of a thick, orange-coloured liquid, which, on being placed under a microscope and moistened with salt water, will be found to be composed of innumerable *antheridia*, from which will issue troops of zoospores, which, the moment of their liberation, commence those strange animal motions which have so much puzzled philosophers to reconcile with vegetable life.

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Fig. 1. *FUCUS SERRATUS* :—*natural size*. 2. Transverse section of the *receptacle*, showing two *conceptacles*. 3. Spores from the same. 4. A cluster of *antheridia*. 5. An *antheridium* containing *zoospores*, some of which have escaped :—*all magnified*.

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## PLATE XLVIII.

BOSTRYCHIA SCORPIOIDES, *Mont.*

GEN. CHAR. *Frond* dull purple, filiform, much branched, inarticulate, dotted; traversed by a jointed tube surrounded by one or more concentric layers of oblong, coloured cells, which are gradually shorter towards the circumference; the surface cells quadrate. *Fructification* of two kinds, on distinct individuals; 1, "lateral capsules" (*ceramidia*), *Roth.* 2, *tetraspores*, contained in terminal, lanceolate pods. BOSTRYCHIA (*Mont.*),—from βόστρυχος, a ringlet, or curl of hair.

BOSTRYCHIA *scorpioides*; frond flexuous, subdichotomous; the branches three or four times pinnated; pinnæ and pinnulæ patent; apices strongly rolled inwards.

BOSTRYCHIA *scorpioides*, *Mont. Hist. Cuba, Bot.* p. 39 (1838).

HELICOTHAMNION *scorpioides*, *Kütz. Phyc. Gen.* p. 433. t. 53. v.

ALSIDIUM *scorpioides*, *J. Ag. in Linn.* vol. xv. p. 28. *Endl. 3rd Suppl.* p. 46.

RHODOMELA *scorpioides*, *Ag. Sp. Alg.* vol. i. p. 380. *Ag. Syst.* p. 200. *Grev. Alg. Brit.* p. 105. *Hook. Br. Fl.* vol. ii. p. 294. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* p. 68. *Wyatt, Alg. Danm.* no. 69.

FUCUS *scorpioides*, *Gmelin, Hist. Fuc.* p. 135.

FUCUS *amphibius*, *Huds. Fl. Ang.* p. 590. *Stack. Ner. Brit.* p. 86. t. 14. *E. Bot.* t. 1428. *Turn. Syn.* vol. ii. p. 391. *Turn. Hist.* t. 109.

PLOCAMIUM *amphibium*, *Lamour. Ess.* p. 50.

HAB. On muddy sea shores, near high-water mark; at the estuaries of rivers; in salt water ditches and marshes, adhering to the roots of flowering-plants; also on submarine rocks within tide marks. Annual. Summer. Selsey marshes, *Martyn.* North Wales, *Rev. H. Davies.* Shoreham, on *Atriplex portulacoides*, *Mr. Borrer.* Mouth of the river Dart, *Mrs. Griffiths.* Tydd marsh, Cambridgeshire, *Mr. Skrimshire.* Shore of Blackwater, near Maldon, *Mr. E. Forster.* Plymouth, Barmouth, Pool near Dolgelly and at the Menai bridge, *Mr. Ralfs.* Port-Stewart, Ulster, *Mr. D. Moore.* Baldoyle, *Mr. M'Calla* and *Mr. Bain.* River Shannon, at Tarbert, *Mr. W. Andrews.*

GEOGR. DISTR. Atlantic shores of Europe, from England to Spain.

DESCR. *Fronds* two to four inches high, rather thicker than hogs' bristles, growing in large, entangled tufts, filiform, flexuous, divided at irregular intervals into a few main branches, which are either alternate or subdichotomous, patent, and having their apices rolled into a spiral curl. These branches are beset, at short intervals throughout their extent, with very patent or reflexed, short branchlets, from a quarter to half an inch in length, and much more slender than the main branches. Like the latter, their apices are more or less inrolled, and they are either pinnate or bi-tripinnate, with gradually decreasing patent ramuli, of which the ultimate are subulate and thorn-like. Under the microscope the frond appears to be beautifully

dotted, or clothed with a tessellated membrane. A transverse section (fig. 4.), exhibits a narrow central tube, surrounded by several rows of hexagonal cells, each of which contains a coloured bag; a longitudinal section (fig. 5.), shows that the central tube is jointed at intervals of four to five times its breadth, and that the cells that encompass it become gradually shorter towards the circumference. The *fruit* (which I have not seen) consists of *ceramidia*, which have only been noticed by Roth, by whom they are very imperfectly described; and *stichidia*, or lanceolate pods, terminating the branches, and containing triparted tetraspores. *Colour* purplish, brownish or greenish, according to locality. *Substance* cartilaginous, imperfectly adhering to paper in drying.

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In the year 1838, Dr. Montagne, in the botanical portion of M. de la Sagra's history of Cuba, established his genus *Bostrychia* upon *B. scorpioides*, and a tropical species, *B. calamistrata*, with which he has since associated several others, having similar organization; and I wish now to extend the generic character, so as to comprise a little group of southern species, to which I have elsewhere applied the name *Stictosiphonia*, which differ from the type, in having their central tube surrounded by a single row of coloured cells. The genus thus constituted consists of ten species, all of which have a similar habit, and all are found in situations either bordering on high-water mark, or in places where a considerable quantity of fresh water flows into the sea. In this respect they differ from most other *Rhodomeleæ*, a tribe of Algæ the majority of which grow at a considerable depth, and are peculiarly impatient of the contact of fresh water. So little is this the case with our *B. scorpioides* that it has been called *amphibia*, from its sometimes growing in ditches of brackish water, and such also, according to Dr. Hooker, are the situations chosen by *B. vaga*, at Kerguelen's Land.

The name *Helicothamnion*, proposed by Kützinger for *B. scorpioides*, must be laid aside, as that of *Bostrychia* has the priority, is equally applicable, and more euphonious. By Prof. J. Agardh this group is included in *Alsidium*, but it scarcely agrees with the character of that genus, and still less with the habits of its species.

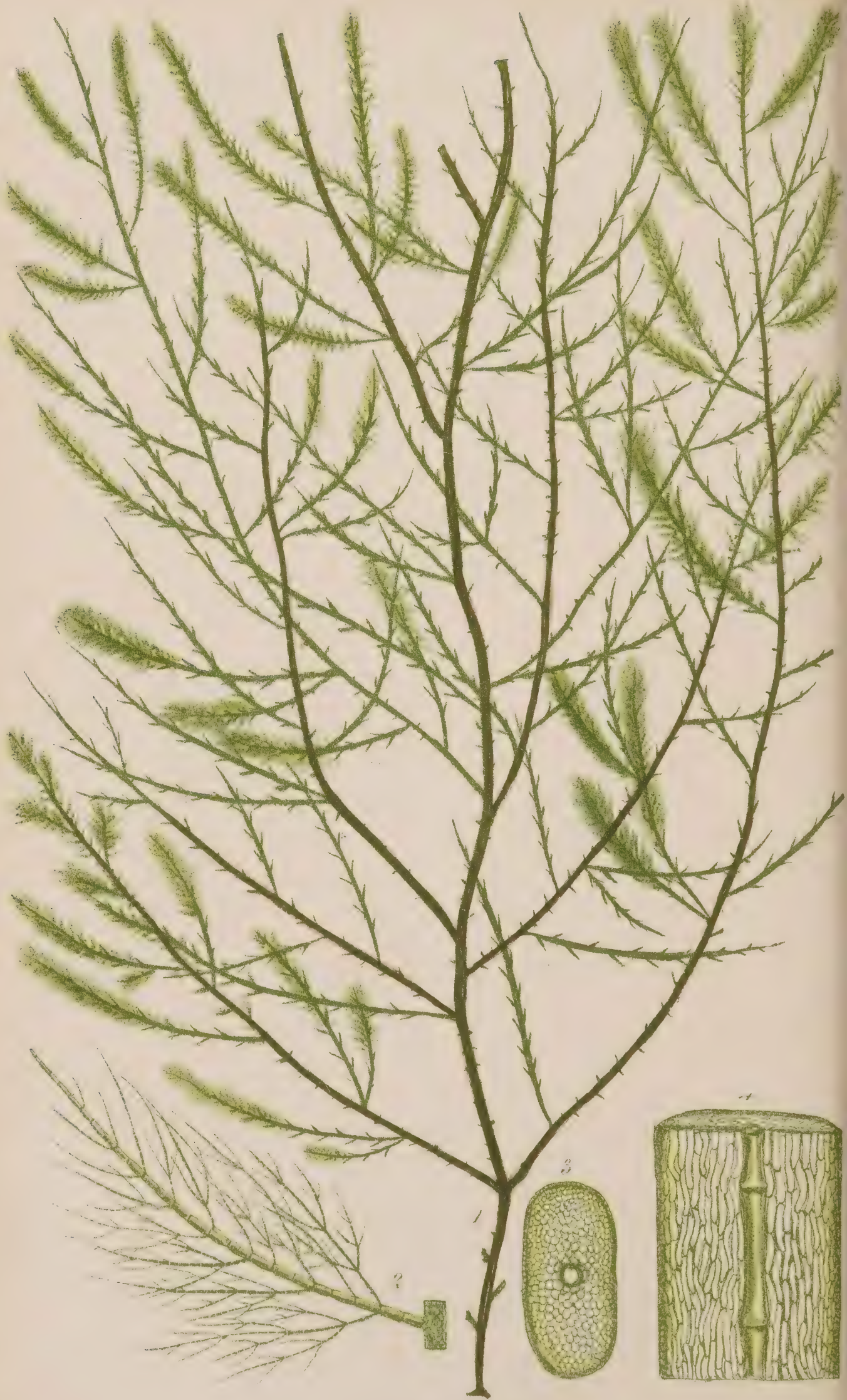
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Fig. 1. *BOSTRYCHIA SCORPIOIDES*, a tuft:—*of the natural size*. 2. Part of a branch. 3. Involute apex of the rami, with a portion of a lateral branchlet. 4. Transverse section of a branch. 5. Longitudinal section of the same:—*all more or less highly magnified*.

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## PLATE XLIX.

DESMARESTIA ACULEATA, *Lamour*.

GEN. CHAR. *Frond* linear, either filiform, compressed, or flat, distichously branched, cellular, traversed by an internal, single-tubed, jointed filament; producing, when young, marginal tufts of byssoid, branching fibres. *Fructification* unknown. DESMARESTIA (*Lamour*.)—in honour of *A. G. Desmarest*, a celebrated French naturalist.

DESMARESTIA *aculeata*; stem short, cylindrical, bearing numerous slender, elongate, flattish, irregularly bi-tri-pinnate branches; pinnæ and pin-nulæ alternate, tapering at the base, filiform, either fringed with opposite tufts of bright green fibres, or margined with erect, awl-shaped, alternate, distichous spines.

DESMARESTIA *aculeata*, *Lam. Ess.* p. 25. *Grev. Alg. Brit.* p. 38. t. 5. f. 2, 3. *Hook. Br. Fl.* vol. ii. p. 273. *Harv. in Mack. Fl. Hib.* part 3. p. 172. *Wyatt, Alg. Danm.* no. 158. *Harv. Man.* p. 26. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 343. t. 26. f. 1.

DESMIA *aculeata*, *Lyngb. Hyd. Dan.* p. 34. t. 44. B. 1.

SPOROCHNUS *aculeatus*, *Ag. Sp. Alg.* vol. i. p. 151. *Ag. Syst.* p. 259. *Hook. Fl. Scot.* part 2. p. 96. *Grev. Fl. Edin.* p. 287.

FUCUS *aculeatus*, *Linn. Sp. Pl.* p. 1632. *Huds. Fl. Ang.* p. 585. *Light. Fl. Scot.* p. 924. *Fl. Dan.* t. 355. *Stack. Ner. Brit.* p. 24. t. 8. *Turn. Syn.* vol. ii. p. 262. *Turn. Hist.* t. 187.

FUCUS *muscoides*, *Linn. Sp. Pl.* p. 1630. *Huds. Fl. Ang.* p. 590.

HAB. On rocks and stones in the sea, near low-water mark, and at a greater depth. Perennial. Common on the shores of the British Islands.

GEOGR. DISTR. Atlantic shores of Europe, from North Cape to Spain. Shores of Piedmont, *Allioni* (but omitted by *J. Agardh* in his *Alg. Medit.*).

DESCR. *Root* a hard disc. *Fronde*s 1–3, to 6 feet in length, undivided, or branching from a short distance above the base, preserving throughout a nearly equal breadth of half a line, compressed, more or less angularly flexuous, bearing along their whole length alternate lateral branches, the lower of which are longest, the rest gradually shorter upwards. *Lower branches* repeatedly compound, bearing one, two, or three sets of distichous, alternate, erect or erecto-patent lateral branches; *upper* ones gradually less and less compound, and those near the apex quite simple. Occasionally two branches spring from the same point, at the same side of the stem; and more rarely, two of the lesser branches are found opposite to each other. In an early stage of growth all the branches are clothed, at intervals of about a line, with opposite pencils of finely divided, repeatedly pinnate, byssoid, articulated fibres of a beautiful yellow-green colour, which apparently originate in the jointed thread which runs through the centre of the frond. These fibres soon fall away, leaving the stems and branches naked, and then alternate, subulate spines are developed at intervals of two to four

lines along the margin. Occasionally spines and filaments are to be found at the same time, the former being slender and weak. *Substance* cartilaginous when young; very rigid when old. *Colour*, at first, pale greenish olive, finally, foxy brown.

---

At different stages of its growth this plant presents such opposite appearances, that a young botanist may readily mistake, for two species, forms which depend entirely on age, and which have deceived even Linnæus himself. When young, the whole frond is of a tender substance, bright green colour, and beautifully fringed with filaments; when old, it is coarse, brown, naked, and thorny. In plants of the second year, such as our figure represents, these characters are often found combined in the same specimen, in which the older parts of the frond are naked and spiny, the younger shoots being green and clothed with pencilled filaments. No fructification has yet been observed on this, or any other, species of *Desmarestia*.

In the Southern Ocean a closely allied species was found at Cockburn Island, lat.  $64^{\circ} 13'$  S., by the officers of the 'Erebus' and 'Terror', nearly at the southern limit at which they observed a marine vegetation. It appears to be identical with *D. media*, Ag., a species originally found at Unalascha, in Russian America, and differs from *D. aculeata* in having the branches generally opposite or nearly so. It, indeed, presents characters almost exactly intermediate between *Dichloria viridis* and *D. aculeata*; so much so, that I do not think the genus *Dichloria* can be retained as distinct from *Desmarestia*, notwithstanding the absence of confervoid filaments.

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Fig. 1. *DESMARESTIA ACULEATA*; a small plant:—*natural size*. 2. One of the byssoïd fibres. 3. Transverse section of the frond. 4. Longitudinal semi-section of the same:—*magnified*.

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## PLATE L.

RHODOMELA LYCOPODIOIDES, *Ag.*

GEN. CHAR. *Fron*d filiform, solid, much branched, inarticulate, reticulated; the axis composed of concentric layers of oblong, hyaline cells; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores* immersed in swollen ramuli, in a single row. RHODOMELA (*Ag.*)—from *ῥοδεος*, *red*, and *μέλας*, *black*; because the species usually become darker in drying.

RHODOMELA *lycopodioides*; frond divided near the base into several long, simple branches, which are densely beset with slender, finely-divided branchlets, mixed with the short, rigid, bristle-like remains of a former series.

RHODOMELA *lycopodioides*, *Ag. Sp. Alg.* vol. i. p. 377. *Ag. Syst.* p. 199. *Grev. Alg. Brit.* p. 102. *Hook. Br. Fl.* vol. ii. p. 294. *Harv. in Mack. Fl. Hib.* part 3. p. 196. *Harv. Man.* p. 67. *Endl. 3rd Suppl.* p. 47.

GIGARTINA *lycopodioides*, *Lyngb. Hyd. Dan.* p. 45. *Grev. Fl. Edin.* p. 289.

FURCELLARIA *lycopodioides*, *Ag. Syn.* p. 11. *Hook. Fl. Scot.* part 2. p. 97.

LOPHURA *lycopodioides*, *Kütz. Phyc. Gen.* p. 435.

FUCUS *lycopodioides*, *Linn. Syst. Nat.* p. 717. *Turn. Syn.* vol. ii. p. 343. *E. Bot.* t. 1163. *Turn. Hist.* t. 12.

CONFERVA *squarrosa*, *Fl. Dan.* t. 357.

HAB. Growing on the stems of *Laminaria digitata*. Perennial. Spring and Summer. Coast of Scotland and of the North of Ireland, frequent. Scarborough, *Sir T. Frankland*. Coast of Northumberland, *Mr. Winch*. Durham, *Mr. J. Thornhill*. Cromer, *Mr. Woodward*. Balbriggan, *Miss Gower*.

GEOGR. DISTR. Northern Europe.

DESCR. *Root* a small disc. *Fron*ds from four inches to two feet in length, about half a line in diameter at base, attenuated upwards, cylindrical, filiform, tufted, either simple, or divided at a short distance from the base into several long simple branches, clothed in its winter state with short, rigid, simple, or slightly branched, imbricated ramuli, from half an inch to an inch in length; in summer throwing out from these and from the main stems, numerous, capillary, multifid ramuli, usually from one to two inches in length, but occasionally lengthened into branches from six to fourteen inches in length, and bearing, at short distances, broad tufts of multifid ramuli resembling those usually borne by the main stem. *Capsules* abundant on the summer ramuli, ovate, containing a tuft of pear-shaped seeds. *Tetraspores* tripartite or cruciate, contained in clustered or racemose, stichidiform



ramuli borne by the winter branchlets. *Substance* cartilaginous, in its winter state not adhering to paper; much more tender in summer. *Colour* a purplish brown, becoming very black in drying.

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The summer and winter conditions of this species are so unlike each other that I have thought it necessary to represent both, which I could only accomplish within the limits of an octavo plate by figuring very small, but characteristic specimens of each. The summer plant (*fig. 1*) is one of the first year's growth. Those of the second year have the stems clothed with the remains of old ramuli, besides being feathered with young ones. In some magnificent specimens, collected by my friend Mr. Thompson on the Downshire coast, the frond is twenty inches in length, and the lateral branches from six to fourteen inches long; and Dr. Greville informs me that some of his specimens are of equal size. Nothing can well exceed the beauty of such plants, as they wave freely in the water.

Though the common forms of *R. lycopodioides* seem to be very different from *R. subfusca*, specimens are sometimes found which have an intermediate character. The latter is usually a much more branching plant, and is generally found attached to rocks, and its ramuli are much less dense. The microscopic structure in both is very similar.

I must enter a protest against the unnecessary substitution by Kützing of his name *Lophura*, for the old established and universally received *Rhodomela*. Such alterations of established names are most mischievous, leading to no good result, and burdening the science with a number of useless synonymes; and I regret, the more so because his great merits are thereby obscured, that this is not a solitary instance in which this author has needlessly altered the nomenclature.

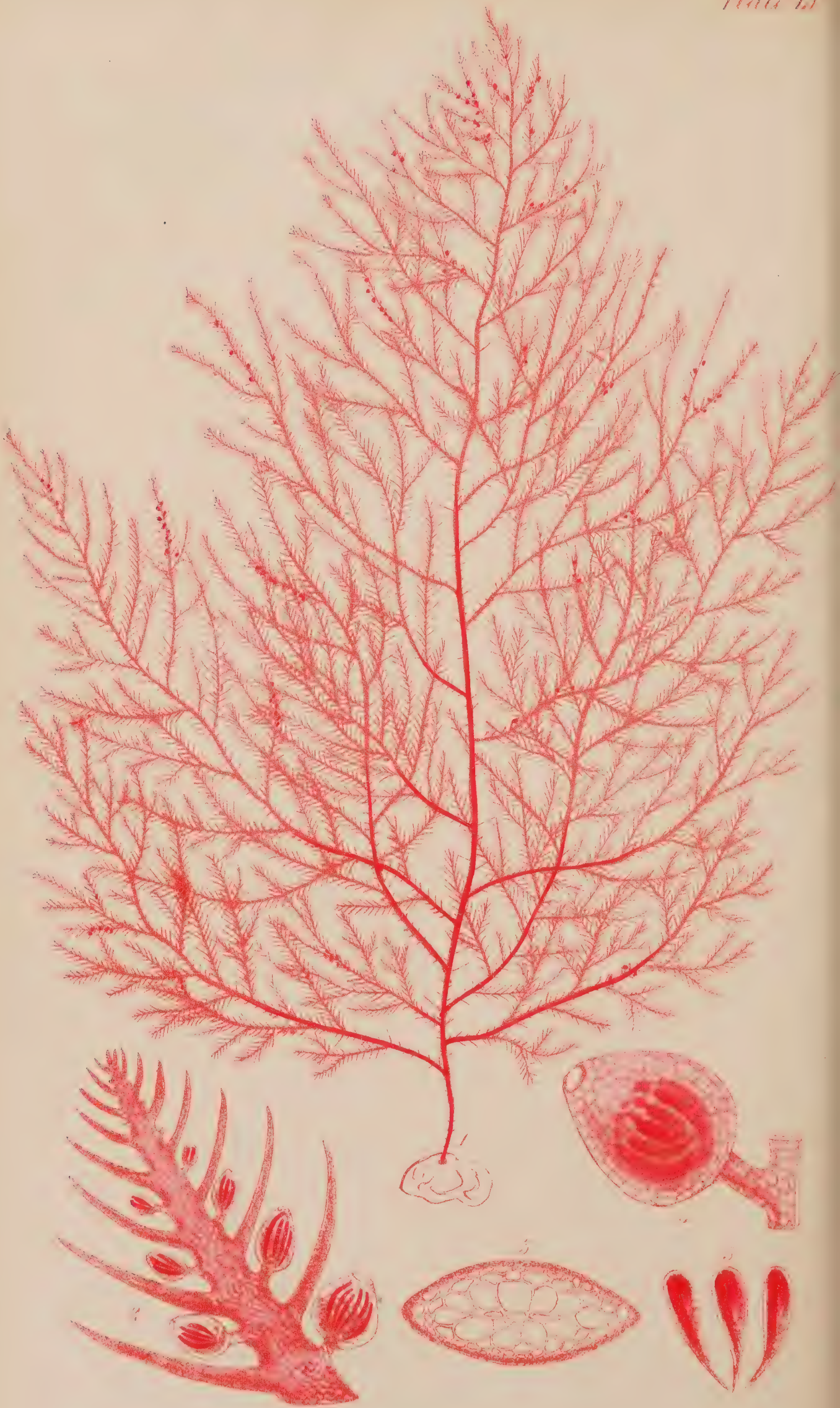
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Fig. 1. RHODOMELA LYCOPODIOIDES, a young summer plant. 2. The same; a winter plant:—*both of the natural size*. 3. A cluster of pods, with tetraspores. 4. A pod separated. 5. Ramulus with capsules. 6. A capsule, separated. 7. Longitudinal section of the stem. 8. Transverse section of one half of the same:—*all more or less magnified*.

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## PLATE LI.

BONNEMAISONIA ASPARAGOIDES, *Ag.*

GEN. CHAR. *Fronde* filiform, inarticulate, compressed or plane, much branched, the branches margined with distichous, subulate, alternate ciliæ. *Fructification*; ovate capsules (*ceramidia*) furnished with a terminal pore, and containing a tuft of pear-shaped spores. BONNEMAISONIA (*Ag.*)—in honour of *M. Bonnemaïson*, a French naturalist.

BONNEMAISONIA *asparagoides*; frond compressed or sub-terete; capsules stalked, opposite the ciliæ.

BONNEMAISONIA *asparagoides*, *Ag. Sp. Alg.* vol. i. p. 197. *Syst.* p. 246. *Grev. Alg. Brit.* p. 107. t. xiii. *Hook. Br. Fl.* vol. ii. p. 295. *Harv. in Mack. Fl. Hib.* part 3. p. 197. *Harv. Man.* p. 68. *J. Ag. Alg. Medit.* p. 116. *Endl. 3rd Suppl.* p. 43. *Kütz. Phyc. Gen.* p. 438.

PLOCAMIUM *asparagoides*, *Lam. Ess.* p. 50.

CERAMIUM *asparagoides*, *Roth. Cat. Bot.* vol. iii. p. 110.

FUCUS *asparagoides*, *Woodw. in Linn. Trans.* vol. ii. p. 29. t. 6. *E. Bot.* t. 571. *Turn. Syn.* vol. ii. p. 364. *Turn. Hist.* t. 101.

β, *teres*; frond capillary, terete; ciliæ very long.

HAB. On submarine rocks, near low water mark, and at a greater depth. Annual. June to September. Yarmouth, *Mr. Wigg.* Cromer, *Mr. D. Turner.* Cornwall coast, *Mr. Stackhouse.* Sunderland, *Mr. Weighell.* Torquay, *Mrs. Griffiths.* Torpoint, *Rev. W. S. Hore.* Falmouth, *Miss Warren.* Mount's Bay, *Mr. Ralfs.* Scilly Islands, *Miss White.* Jersey, *Miss White and Miss Turner.* Bantry Bay, *Miss Hutchins.* Donaghadee, *Mr. Templeton.* Belfast Bay, *Dr. Drummond.* Miltown Malbay, *Mr. J. Fennell.* Kilkee, Kingstown Harbour, and Wicklow, *W. H. H. Howth, Miss Gower.* Malahide and Carrickfergus, *Mr. Mc' Calla.* Saltcoats, *Rev. D. Landsborough.* Ardrossan, *Major Martin.*

GEOGR. DISTR. Atlantic shores of Europe, from Sweden (*Aresch.!*) to Spain. Mediterranean Sea, *J. Agardh.*

DESCR. *Root* a small disc. *Fronde*s either solitary or somewhat tufted, from four inches to a foot in length, commonly compressed, rarely cylindrical or nearly so, varying in breadth from the thickness of a bristle to nearly a line, furnished with an undivided stem which is set throughout its whole length, except for a short distance above the base with alternate, closely placed, patent branches, the lowermost of which are the longest, the upper being gradually shorter as they approach the apex: thus giving to the frond an ovate outline. *Lower* branches similar to the stem in all respects, furnished with a second, third, or even fourth series of lesser branchlets; upper branches less divided. Every part of the frond is pectinated, at distances of a line or less, with subulate, alternate ciliæ, a line in length; on the older stems only are they partially obliterated. The capsules, which are invariably

placed opposite to the ciliæ, are ovate, supported on a short stalk, and contain a tuft of pear-shaped spores; they are formed from metamorphosed branches, not from ciliæ; a fact proved by their position being the same as that of normal branches, and illustrated by specimens gathered by *Mrs. Wyatt*, in which they are partly converted into ramuliferous branchlets. *Colour*, a fine, pellucid crimson. *Substance* soft, flaccid, and adhering to paper in drying. Var.  $\beta$  differs from the common form in being cylindrical, with ramuli twice as long as usual.

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A highly beautiful species, and so unlike any other British Alga that it must be recognized at a glance. The delicate ciliæ which border every part of the frond, and which are arranged with strict regularity, being always perfectly distichous, and placed *alternate* to each other, and *opposite* either to a capsule or to a branch, taken in connection with the cellular frond and brilliant colour, afford marks that cannot be mistaken.

*Bonnemaisonia asparagoides* was discovered by Mr. Wigg, whose name is so often mentioned in connection with our rarer Algæ, and first described by Mr. Woodward, in the second volume of the 'Linnæan Transactions'. It has since been found on many of the European shores, but not yet, that I am aware of, out of Europe.

The pear-shaped spores which the capsules contain, are said, by authors, to be *compound*, that is, composed of several separate sporules, like those of *Fucus serratus*, or *Cutleria multifida*. This character, though I have repeatedly looked for, I have never been able to observe; to me they appear to be filled with a homogeneous, granular matter, in all respects similar to what occurs in the other Chondrieæ. *Tetraspores* have not yet been found on this Alga; to judge by analogy, they ought to exist, if formed at all, in the ciliæ, and in specimens where capsules were wholly suppressed. *Capsules* are abundantly produced, and on the very numerous specimens which have come under my notice, though they have varied greatly in number upon each, I never saw any specimen from which they were wholly absent.

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Fig. 1. BONNEMAISONIA ASPARAGOIDES:—*natural size*. 2. Apex of a branch showing capsules in different stages of growth. 3. Transverse section of a branch. 4. A capsule. 5. Spores:—*all more or less highly magnified*.

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## PLATE LII.

FUCUS MACKAII, *Turn.*

GEN. CHAR. *Fron*d linear, either flat, compressed, or cylindrical, dichotomous (rarely pinnated), coriaceous. *Air vessels*, when present, innate, simple. *Receptacles* either terminal, or lateral, filled with mucus traversed by a net-work of jointed fibres, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores*, or *antheridia*, or both. FUCUS (*L*), *φύκος*, a seaweed.

FUCUS *Mackaii*; frond cylindrical or subcompressed, slender, much branched; branches dichotomous; air vessels elliptical, solitary; receptacles lateral, lanceolate, ovate, or forked, stalked, pendulous, scattered, near the base of the branches.

FUCUS *Mackaii*, *Turn. Hist.* t. 52. *Sm. E. Bot.* t. 1927. *Lam. Ess.* p. 20. *Ag. Sp. Alg.* vol. i. p. 87. *Hook. Fl. Scot.* part 2. p. 95. *Grev. Alg. Br.* p. 17. *Hook. Br. Fl.* vol. ii. p. 268. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Grev. in Phyc.* vol. i. p. 465.

FUCUS *nodosus*, γ. *Mackaii*, *Ag. Syst.* p. 275.

PHYSOCAULON *Mackaii*, *Kütz. Phyc. Gen.* p. 352.

HAB. Muddy sea shores, usually in land-locked bays, and among boulders. Perennial. April and May. Birterbui Bay, Cunnemara, *Mr. J. T. Mackay*. (1805). Loch Seaforth, *Lord Seaforth*. Arasaig, *Mr. Borrer*. Loch Coul and Kyle Scough, Sutherland, *Messrs. Borrer and Hooker*. East coast of Skye, and head of Loch Duich *Messrs. Hooker and Greville*.

GEOG. DISTR. North of Europe. Baltic sea, *Areschoug*.

DESCR. *Fron*ds growing in globular tufts the size of a human head or larger, many fronds radiating from a subcentral point, but without obvious root or attachment. *Fron*ds 6-12 inches long, from half a line to two lines in diameter, cylindrical or subcompressed, cartilagineo-coriaceous, rather brittle, ribless, with a short, simple or forked main stem, from which issue, without much regularity, numerous long, repeatedly dichotomous or occasionally trichotomous branches, which gradually taper to the apices, where they are often less than a quarter of a line in diameter, and are beset throughout their length with more or less frequent, lateral, simple, or forked, patent ramuli. *Axils* patent, rounded; apices blunt. *Vesicles* from a quarter to half an inch in length, two lines wide, few, occurring generally below the forkings of the longer branches; sometimes wanting. *Receptacles* lateral, borne by slender peduncles issuing irregularly from the sides of the branches near their base, pendulous, lanceolate, or bilobed, or somewhat ovate, yellow, containing numerous spherical *conceptacles*, full of roundish spores, each of which separates at maturity into four sporules. *Colour* a dull olive. *Substance* when dry somewhat horny and translucent.

*Fucus Mackaii* was discovered in the year 1805, on the western coast of Ireland, by Mr. James Townsend Mackay, author of the *Flora Hibernica*, in honour of whom the species has been named by Mr. Dawson Turner in his great work, the '*Historia Fucorum*'. For a long time the fructification remained undiscovered, and, consequently, a doubt rested on the validity of the species, the resemblance, in many respects, to a dwarfed variety of *Fucus nodosus* suggesting a probability that it was only a form of that plant. No doubt the connection between these plants is very strong, yet the difference in ramification is so great, and the constancy of character observed in *Fucus Mackaii* in many widely distant localities in which it has been abundantly found, is so remarkable, that added now to distinctions, afforded by the position of the fruit, its characters are better established. Still, its habitat is anomalous, and it may be urged that the peculiar characters originate in this habitat. The *Fuci* in general are attached by scutate roots to rocks and stones; *Fucus Mackaii* invariably lies unattached, resting in its place, by its own weight, on mud, gravel, or among loose boulders. In such situations it flourishes from year to year, and fruits abundantly.

The fruit was first observed by Dr. Greville in the autumn of 1842, in the collection of Mrs. Captain Maynard at Stanraer, to whom it was communicated by Dr. Lindsay from the Isle of Skye. More recently, in the Spring of 1846, Mr. Mc' Calla found an abundance of specimens in fructification, which is, probably, produced every year, but from the early season at which it is formed, when few botanists have an opportunity of seeing the plant, unless resident near its place of growth, the fruit has hitherto escaped detection. From a fine specimen, communicated to me by Mr. Mc' Calla, in a fresh state, my figure has been taken, and I have since (in June) had the pleasure of gathering fine fruiting specimens in the Sound of Skye. The pendulous receptacles, produced at the bases of the main branches, and the contrast between their clear greenish yellow, and the olivaceous colour of the frond, have a very pretty effect.

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Fig. 1. *FUCUS MACKAII*:—*natural size*. 2. Transverse segment of a receptacle.  
 3. A spore. 4. portion of the net-work from the centre of the receptacle:  
 —*all highly magnified*.

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## PLATE LIII.

GELIDIUM CORNEUM, *Lamour*.

GEN. CHAR. *Fronde* linear, compressed, pinnated; its *axis* composed of densely interwoven, longitudinal, tenacious, continuous fibres; the *periphery* of small, polygonal cellules. *Fructification* of two kinds on distinct individuals; 1, *tubercles* (*favellidia*) immersed in swollen ramuli, containing a spherical mass of oblong spores. 2, *tetraspores* contained in club-shaped ramuli, bipartite or tripartite. GELIDIUM (*Lam.*)—from *gelu*, *frost*, whence also *gelatine*; but none of the species of the restricted genus are *gelatinous*!

GELIDIUM *corneum*; frond between cartilaginous and horny, flattish, distichous; branches linear, attenuated at each end, pinnate or bipinnate; pinnules opposite or alternate, patent, obtuse.

GELIDIUM *corneum*, *Lamour. Ess.* p. 41. *Grev. Alg. Brit.* p. 141. t. xv. *Hook. Br. Fl.* vol. ii. p. 305. *Harv. in Mack. Fl. Hib.* part 3. p. 203. *Wyatt, Alg. Danm.* no. 30. *Harv. Man.* p. 80. *J. Ag. Alg. Medit.* p. 102. *Endl. 3rd. Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 406. *Mont. Pl. Canar.* p. 158.

SPHÆROCOCCUS *corneus*, *Ag. Sp. Alg.* vol. i. p. 279. *Syst.* p. 225. *Hook. Fl. Scot.* part. 2. p. 104. *Grev. Fl. Edin.* p. 296. *Spreng. Syst. Veg.* vol. iv. p. 337.

FUCUS *corneus*, *Huds. Fl. Ang.* p. 585. *Stack. Ner. Brit.* p. 61. t. 12. *Turn. Syn.* vol. ii. p. 272. *E. Bot.* t. 1970. *Clem. Ess.* p. 317.

Var.  $\beta$ , *sesquipedale*; “frond long, between compressed and flat, linear, tripinnate, pinnæ attenuated at their base, ramuli linear, oblong, short, obtuse.”—*Grev.*

GELIDIUM *corneum*, *var. sesquipedale*, *Grev. l. c.* p. 142.

FUCUS *corneus*, *var. sesquipedalis*, *Turn. Hist.* t. 257. f. f.

Var.  $\gamma$ , *pinnatum*; “frond narrow, tripinnate, the pinnæ patent, nearly linear, bluntish.”—*Grev.*

GELIDIUM *corneum*, *var. pinnatum*, *Grev. l. c.*

FUCUS *pinnatus*, *Huds. Fl. Angl.* p. 548.

FUCUS *hypnoides*, *Desv. Fl. Atl.* vol. 2. p. 426.

Var.  $\delta$ , *uniforme*; “all the pinnæ patent, attenuated at the base, obtuse at the points and scattered.”—*Turn.*

GELIDIUM *corneum*, *var. uniforme*, *Grev. l. c.* p. 143.

FUCUS *corneus*, *var. uniformis*, *Turn. l. c.*

Var.  $\epsilon$ , *capillaceum*; “frond narrow, pinnæ clustered towards its summit, nearly setaceous and somewhat erect.”—*Turn.*

GELIDIUM *corneum*, *var. capillaceum*, *Grev. l. c.*

FUCUS *corneus*, *var. capillaceus*, *Turn. l. c.*

Var.  $\zeta$ , *latifolium*; “frond broad, nearly flat, pinnæ linear-lanceolate, mostly simple, set with numerous, short, setaceous pinnæ.”—*Grev.*

GELIDIUM *corneum*, *var. latifolium*, *Grev. l. c.*

Var.  $\eta$ , *confertum*; “frond compressed, repeatedly pinnated, pinnæ and pinnulæ long, very thin, acute and irregularly divided.”—*Grev.*



GELIDIUM corneum, *var. confertum*, Grev. *l. c.*

FUCUS corneus, *var. confertus*, Turn. *l. c.*

Var.  $\theta$ , *flexuosum*; frond rather broad, flat, very flexuous, pinnate or sub-bi-pinnate, pinnæ curved, tapering to each end, subulate.

Var.  $\iota$ , *aculeatum*; "frond compressed, very thin, pinnated very irregularly, pinnæ divaricated, irregularly divided and set with minute divaricate, subulate ramuli, crowded towards the summit of the frond."—Grev.

GELIDIUM corneum, *var. aculeatum*, Grev. *l. c.*

Var.  $\kappa$ , *abnorme*; "frond compressed, irregularly branched, branches and pinnæ producing at their extremities, little tufts of partly deflexed ramuli."—Grev.

GELIDIUM corneum, *var. abnorme*, Grev. *l. c.* p. 144.

FUCUS corneus, *var. abnormis*, Turn. *l. c.* t. 257. f. *r.*

Var.  $\lambda$ , *pulchellum*; "frond capillary, compressed, bi-tripinnate, pinnæ between linear and clavate, obtuse."—Turn.

GELIDIUM corneum, *var. pulchellum*, Grev. *l. c.*

FUCUS corneus, *var. pulchellus*, Turn. *l. c.*

Var.  $\mu$ , *claviferum*; "frond subcylindrical, capillary, irregularly divided, the ultimate ramuli or pinnulæ obovate, edged with minute, scattered teeth."—Grev.

GELIDIUM corneum, *var. claviferum*, Grev. *l. c.*

FUCUS corneus, *var. clavifer*, Turn. *l. c.*

Var.  $\nu$ , *clavatum*; "frond capillary, between cartilaginous and membranaceous, decumbent, creeping; ramuli in the form of inversely lanceolate or ovate leaves, much attenuated at their insertion."—Grev.

GELIDIUM corneum, *var. clavatum*, Grev. *l. c.*

FUCUS pusillus, Stack. *Ner. Brit.* p. 16. t. 6. Turn. *l. c.* t. 79.

FUCUS cæspitosus, Stack. *Ner. Brit.* p. 59. t. 12.

Var.  $\omicron$ , *crinale*; "frond setaceous, subcylindrical, somewhat dichotomously branched, sometimes three-forked at the top, and bearing a few elliptic-oblong ramuli, attenuated at their insertion."—Grev.

GELIDIUM corneum, *var. crinale*, Grev. *l. c.*

FUCUS crinalis, Turn. *Hist. Fuc.* t. 198.

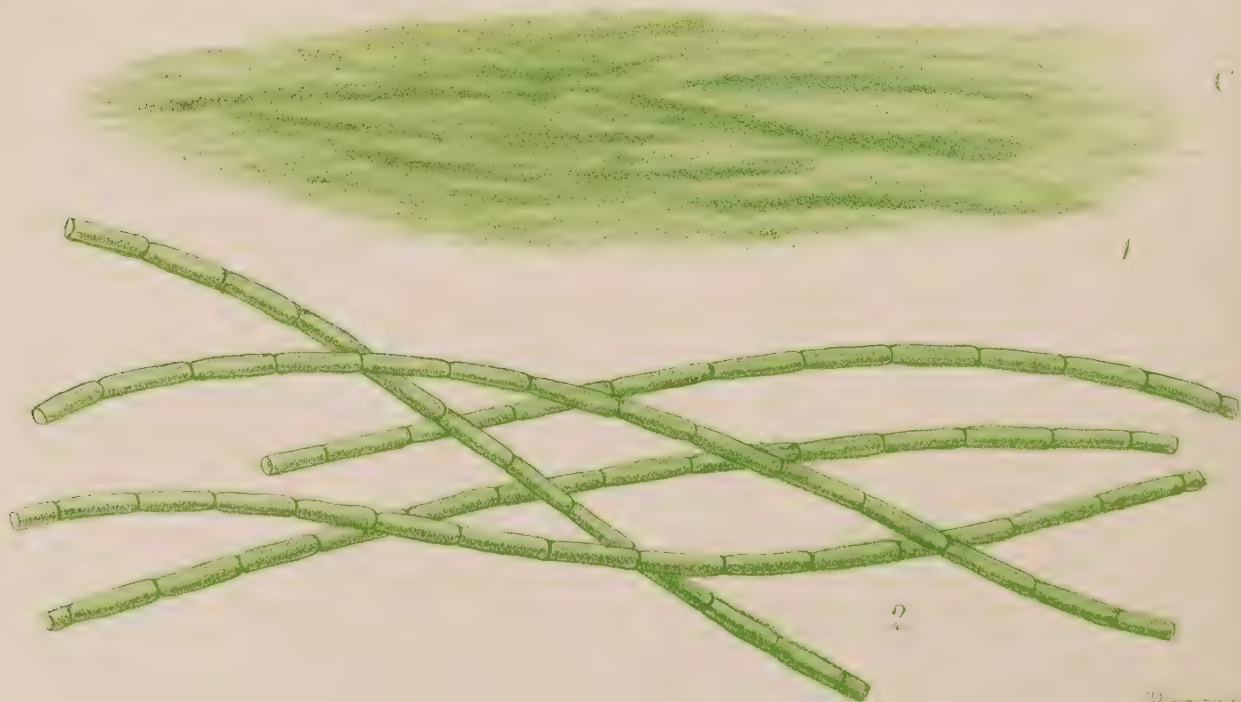
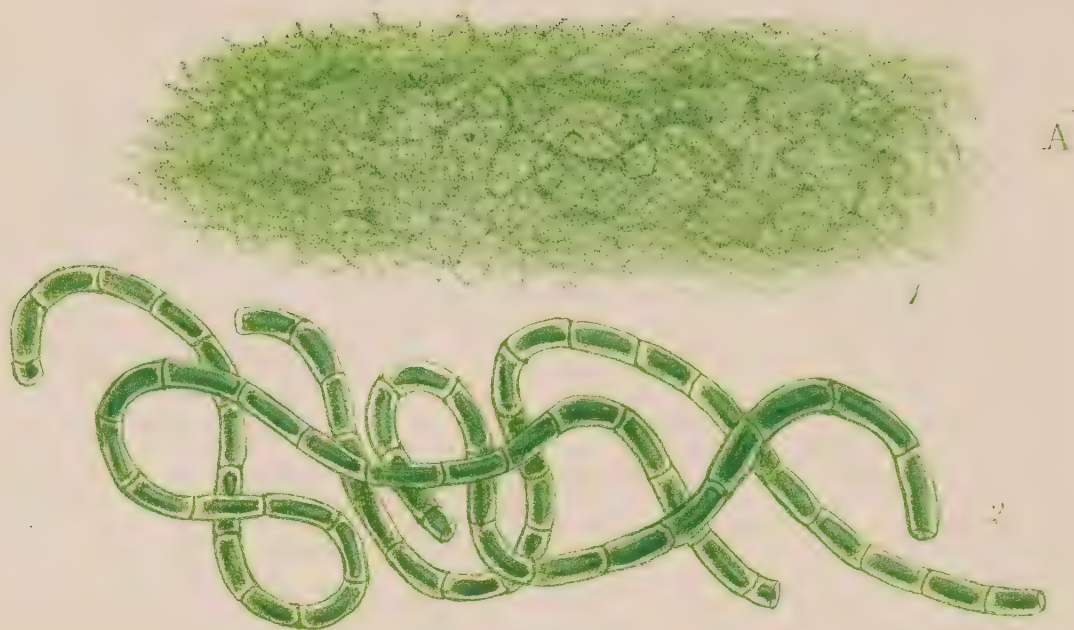
HAB. On submarine rocks, from the verge of high water to the extreme of low water, and, extending to a greater depth; often fringing the margin of tide pools in places shaded by other algæ. Common on all our shores.

GEOGR. DISTR. The temperate and tropical zones of both hemispheres.

A most variable plant, found in some of its varieties in almost all seas, and abundant everywhere. I have but to refer to the accompanying plate, in which I have represented some of the more striking of the British varieties; and to the elaborate analyses of Turner, in the '*Historia Fucorum*,' and of Greville in his '*Algæ Britannicæ*'. My limited space precludes the possibility of entering more fully into its history in this place.

Fig. 1. GELIDIUM CORNEUM, *var.  $\gamma$ . pinnatum*. 2. *var.  $\theta$ . flexuosum*. 3. *var.  $\zeta$ . latifolium*. 4. *var.  $\lambda$ . pulchellum?* 5. *var.  $\omicron$ . crinale*. 6. *var.  $\nu$ . clavatum*. 7. *var.  $\kappa$ . abnorme*.







## PLATE LIV. A.

CONFERVA TORTUOSA, *Dillw.*

GEN. CHAR. *Filaments* green, jointed, unattached, forming stratified bundles, unbranched. *Fruit* aggregated granules or zoospores, contained in the joints, having at some period, a proper ciliary motion. CONVERVA (*Plin.*)—from *conferruminare*, to *consolidate*; because some of the species were used by the ancients in cases of fractured bones.

CONVERVA *tortuosa*; filaments rigid, slender, much curled and twisted, forming broad closely interwoven strata; articulations twice or thrice as long as broad.

CONVERVA *tortuosa*, *Dillw. Conf.* t. 46. *E. Bot.* t. 2220. *Lyngb. Hyd. Dan.* p. 145. t. 49. *Grev. Fl. Edin.* p. 315. *Ag. Syst.* p. 98. *Harv. in Hook. Br. Fl.* vol. ii. p. 352. *Harv. in Mack. Fl. Hib.* part 3. p. 225. *Harv. Man.* p. 129. (excl. var.  $\beta$ .) *J. Ag. Alg. Medit.* p. 12.

HAB. On submarine rocks, at half-tide level; also in salt pools by the edge of the sea. Salt pools by the Yare, and on marine rocks at Swansea, *Mr. Dillwyn*. Frith of Forth, *Messrs. Arnott and Greville*. Miltown Malbay, and Skerries, *W. H. H.* Not uncommon.

GEOGR. DISTR. Shores of Europe. Færoe Islands. Mediterranean Sea.

DESCR. *Filaments* forming crisped strata from a few inches to several feet in diameter, which closely adhere to the inequalities of the rock, or to the plants that grow on it. The mass is of a brilliant green, and glossy. The joints are somewhat variable in length, and generally contain a mass of dense endochrome, which is well preserved in drying, and recovers its form on being moistened.

The plant published in Wyatt's 'Algæ Danmoniensis' under this name belongs, if I mistake not, rather to *C. riparia*, Roth, to which also, perhaps, the *C. perreptans* of Carmichael ought to be referred.

A. Fig. 1. CONFERVA TORTUOSA:—*natural size*. 2. Some of the filaments *magnified*.

## PLATE LIV. B.

CONFERVA IMPLEXA, *Dillw.*

CONFERVA *implexa*; filaments very slender, rather flaccid, forming extensive, much entangled, bright-green strata; articulations about as long as, or longer than, broad.

CONFERVA *implexa*, *Dillw. Suppl.* t. B. *E. Bot.* t. 2309. *Lyngb.* p. 144. t. 49. *Ag. Syst.* p. 91. *Harv. in Hook. Br. Fl.* vol. ii. p. 352. *Harv. in Mack. Fl. Hib.* part 3. p. 226. *Harv. Man.* p. 129. *Wyatt, Alg. Danm.* no. 142.

CONFERVA *ulothrix*, *Lyngb. ? Hyd.* p. 146. t. 50. *Harv ! l. c.* p. 353. *Harv ! Man.* p. 129.

CONFERVA intricata, *Grev! Fl. Edin.* p. 315.

BANGIA Johnstoni, *Grev! in Johnst. Fl. Berw.* p. 260.

BANGIA viridis, *Fl. Dan.* t. 1601. f. 1. (*sec. Lyngb.*)

HAB. On marine rocks, and attached to Algæ. Bantry Bay, *Miss Hutchins.*  
Berwick, *Dr. Johnson.* Frith of Forth, *Dr. Greville.* Torquay, *Mrs.*  
*Griffiths.* Malbay, *W. H. H.* Not uncommon.

GEOGR. DISTR. Shores of Europe. Færoe Islands.

DESCR. *Filaments* about two thirds the thickness of those of *C. tortuosa*, forming densely interwoven strata, or tufts among the branches of other Algæ. *Joints* even in the same thread varying from a little shorter than their breadth, to about once and a half as long. *Colour* a dark grass green.

---

I am now of opinion that the plant called *C. ulothrix* in the British Flora, whether the species intended by Lyngbye or not—a point which I do not determine—cannot be kept separate from *C. implexa*. This species was first noticed by the late Miss Hutchins, at Bantry, and is probably widely dispersed.

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B. Fig. 1. CONFERVA IMPLEXA :—*natural size.* 2. some of the threads *magnified.*

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#### PLATE LIV. C.

### CONFERVA ARENOSA, *Carm.*

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CONFERVA arenosa; filaments slender, straightish, rigid, forming broad strata; articulations from three to five times longer than broad.

CONFERVA arenosa, *Carm. Alg. Appin. ined.* *Harv. in Hook. Br. Fl.* vol. ii. p. 353. *Harv. in Mack. Fl. Hib.* part. 3. p. 226. *Harv. Man.* p. 130.

HAB. On the sandy sea-shore, at half-tide level. Appin, *Capt. Carmichael.* Bantry Bay. *Mr. R. Ball.*

GEOGR. DISTR. Scotland. Ireland.

DESCR. “This species,” says Capt. Carmichael, “occurs in fleeces a yard or more in extent, and of a peculiar structure. They consist of several exceedingly thin layers, placed over each other, but so slightly connected that they may be separated like folds of gauze, to the extent of many inches, without the least laceration. *Filaments* 5 or 6 inches long, about the thickness of *C. bombycina*, rigid, possessed of a peculiar roughness; feeling, when pulled asunder, as if hair were drawn over a piece of rosin. *Articulations* 3–5 times as long as broad; sporular mass assuming a great variety of forms. When old, the filaments become exceedingly rough, and often tubercular.”—*Alg. Appin. ined.*

The great length of the joints readily distinguishes this species from any other British Marine Conferva.

It may be well to observe that the three species here represented are drawn to the same scale.

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C. Fig. 1. CONFERVA ARENOSA :—*natural size.* 2, Some of the filaments *magnified.*

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## PLATE LV.

LAURENCIA PINNATIFIDA, *Lamour.*

GEN. CHAR. *Fronde* cylindrical, or compressed, linear, pinnately branched, the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) furnished with a terminal pore, containing a tuft of pear-shaped spores; 2, triparted tetraspores imbedded in the ramuli. LAURENCIA (*Lamour.*),—in honour of *M. de la Laurencie*, a French naturalist.

LAURENCIA *pinnatifida*; frond compressed or subcylindrical, cartilaginous, bi-tripinnatifid, the divisions alternate; the ultimate ones linear, erecto-patent, simple or lobed.

LAURENCIA *pinnatifida*, *Lamour. Ess.* p. 42. *Grev. Alg. Brit.* p. 108. t. xiv. *Hook. Br. Fl.* vol. ii. p. 296. *Harv. in Mack. Fl. Hib.* part 3. p. 198. *Wyatt, Alg. Danm.* no. 113. *Harv. Man.* p. 69. *Mont. Pl. Canar.* p. 154. *Hook. fil. et Harv. Alg. Nov. Zeal.* no. 65. *Hook. fil. Fl. Ant.* part. i. p. 184. *J. Ag. Alg. Medit.* p. 114. *Mont. Voy. Pole Sud. Bot.* p. 126. *Endl. 3rd Suppl.* p. 43.

CHONDRIA *pinnatifida*, *Ag. Sp. Alg.* vol. i. p. 337. *Syst.* p. 201. *Hook. Fl. Scot.* part. 2. p. 105. *Grev. Fl. Edin.* p. 291. *Kütz. Phyc. Gen.* p. 437.

GELIDIUM *pinnatifidum*, *Lyngb. Dan.* p. 40. t. 9.

FUCUS *pinnatifidus*, *Gm. Linn. Syst. Nat.* p. 1385. *Huds. Fl. Ang.* p. 581. *Lightf. Fl. Scot.* p. 953. *Stack. Ner. Brit.* p. 48. t. 11. *Turn. Syn.* vol. 2. p. 267. *Hist.* t. 20. *E. Bot.* t. 1202.

FUCUS *multifidus*, *Huds. Fl. Ang.* p. 581.

Var.  $\beta$ , *Osmunda*; frond flat, generally undivided; ramuli short, and multifid.

FUCUS *pinnatifidus*,  $\beta$ , *Osmunda*, *Turn. Syst. l. c.* *Hist.* t. 20.

FUCUS *Osmunda*, *Gm. Linn. Syst.* p. 1385. *Gm. Hist. Fuc.* p. 155. t. 16. f. 2. *Stack. Ner. Brit.* p. 46. t. 11.

FUCUS *filicinus*, *Lightf. Fl. Scot.* p. 954. (*Excl. Syn. Huds.*).

Var.  $\gamma$ , *angusta*; frond roundish; ramuli cylindrical, elongated, very erect, slightly thickened upwards.

FUCUS *pinnatifidus*,  $\gamma$ , *angustus*. *Turn. l. c.*

Var.  $\delta$ , *tenuissima*; frond flat, of small size; ramuli very slender and much branched, the branches divaricated.

FUCUS *pinnatifidus*,  $\delta$ , *tenuissimus*, *Turn. l. c.*

Var.  $\epsilon$ , *littoralis*; dwarf, greenish olive; frond flat, broad, tapering to the base; ramuli short, emarginate, bearing cup-like bodies filled with "antheridia." (?)

HAB. On submarine rocks from the extreme of high water mark, to beyond the limit of low water. Abundant on the British coasts.

GEOGR. DISTR. On the shores of the Atlantic, Pacific, Indian and Southern Oceans, abundantly. Mediterranean Sea. Red Sea.

DESCR. *Root* a disc, accompanied by fibres. *Fronde*s tufted, 1–12 inches high or more, from half a line to two or three lines in width, flattish, compressed or subcylindrical; the main stem undivided, or parted into two or three



principal segments, furnished throughout with alternate, distichous branches of various lengths, closely placed, with rounded axils. The smaller *branches* are pinnatifid, the larger bi- or even tri-pinnatifid; the ultimate branchlets obtuse. In  $\gamma$ , the frond is nearly cylindrical, 4–6 inches long, about half a line in diameter, of nearly equal breadth throughout, with a simple stem, furnished with branches gradually decreasing in length upwards, so that the outline is conical. These branches are not strictly distichous, and their ramuli, which are long, simple and very erect, are frequently inserted on all sides of the pinnæ.  $\delta$ , is one or two inches high, a line in width, tapering greatly to the base, bare of ramuli below, more or less pinnatifid or bi-pinnatifid above, the ultimate laciniae short. This variety almost always produces in the tips of its ramuli urn-shaped or cup-shaped bodies (fig. 3. 4.), filled with branching, gelatinous, yellow filaments, the apex of one of which is represented at fig. 6, composed of minute cellules lying loosely together, with a row of larger cells running through the centre, and others resembling drops of oil at their tips. *Fructification*; 1, ovate capsules, seated on the ramuli, containing a tuft of pear-shaped spores; 2. triparted tetraspores, immersed in the surface cells of the ramuli. *Colour* varying, according as the plant grows in places exposed to the sun, or the contrary, from pale yellow, to greenish olive, olive-brown, and lurid-purple. *Substance* cartilaginous.

Few of the marine Algæ exhibit a greater variety of forms and sizes than the subject of this plate, which abounds on all the British shores, and is found in equal plenty along the coasts of the Atlantic, and Pacific Oceans, in the Tropical seas, and as far south as Cape Horn. It commences to grow nearly at high water mark, covering the rocks with a stunted vegetation, of a yellowish, or livid green, scarcely larger than the neighbouring *Lichina pygmæa*, and continues, increasing in luxuriance with the increasing depth of water, down to the region of the *Laminariæ*, where it reaches its highest developement, and perhaps extends to a greater depth.

Among its varieties, the var.  $\gamma$ , *angusta*, has most the look of a distinct species, and sometimes closely resembles *L. obtusa*, but from that really distinct species it may be known by its colour, the more erect, alternate ramuli, and by its place of growth; *L. obtusa* being a parasitic plant. This variety is chiefly found on loose stones, in gravelly places, and where fresh water runs into the sea.

*Laurencia pinnatifida* has often, though not invariably, a hot and biting taste, and was formerly eaten in Scotland under the name of Pepper Dulse. It does not appear to have ever been in much repute, as an article of food, and its use is now rare.

Fig. 1. LAURENCIA PINNATIFIDA, the normal condition. 2. The variety  $\epsilon$ :—both of the natural size. 3. An urn-shaped, and 4, a cup-shaped body from the tips of var.  $\epsilon$ . 5. One of these laid open. 6. Part of a filament from the same. 7. Ramulus with capsules. 8. Tuft of spores. 9. Tetraspores in the ramuli. 10. A tetraspore. 11. Longitudinal section of the stem.









## PLATE LVI.

SPOROCHNUS PEDUNCULATUS, *Ag.*

GEN. CHAR. *Fron*d filiform, solid, cellular, the axis more dense. *Fructification*; lateral, crested, stalked *receptacles* composed of horizontal, branching filaments whorled round a central axis, and producing obovate *spores*. *Crest* deciduous, consisting of byssoid, jointed fibres. —SPOROCHNUS (*Ag.*), σπόρος, a seed, and χνούς, wool; because tufts of fibres accompany the fructification.

SPOROCHNUS *pedunculatus*; stem undivided; branches lateral, long, simple, horizontal; receptacles elliptical.

SPOROCHNUS *pedunculatus*, *Ag. Sp. Alg.* vol. 1. p. 149. *Syst.* p. 259. *Grev. Alg. Brit.* p. 41. t. vi. *Hook. Br. Fl.* vol. ii. p. 274. *Harv. in Mack. Fl. Hib.* part 3. p. 173. *Wyatt, Alg. Danm.* no. 104. *Harv. Man.* p. 27. *Endl. 3rd Suppl.* p. 28. *Kütz. Phyc. Gen.* p. 342.

GIGARTINA *pedunculata*, *Lam. Ess.* p. 48.

FUCUS *pedunculatus*, *Huds. Fl. Ang.* p. 587. *With.* vol. iv. p. 120. *Stack. Ner. Brit.* p. 110. t. 16. *E. Bot.* t. 545. *Turn. Syn.* vol. ii. p. 367. *Turn. Hist.* t. 188.

HAB. On submarine rocks, shells, &c., near low water mark, and at a greater depth; rare. Annual. Summer and Autumn. Eastern and southern coasts of England. Anglesea, *Rev. H. Davies*. Preston Pans, Frith of Forth, *Mr. Hasell*. Bantry Bay, *Miss Hutchins*. Killiney, *W.H.H.* Belfast Bay, *Mr. W. Thompson*. Malahide, and Roundstone Bay, *Mr. Mc' Calla*. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic shores of France. British Islands.

DESCR. *Root* a small disc. *Stem* 6–18 inches long, as thick as hog's bristle, cylindrical, smooth, perfectly simple, furnished throughout its length with numerous lateral branches, at distances of from one to four lines asunder. *Branches* three to six inches long, half the diameter of the stem, gradually tapering to a fine point, quite simple, like the stem, the whole margined throughout with receptacles. The *receptacles* are at first sessile and wart-like, gradually they become stalked, the stalk varying, at different ages, and in different specimens, from a quarter of a line to nearly two lines in length. They are of an oblong-elliptical, or, finally, spindle form, and are crowned with a pencil of delicate byssoid, simple, jointed fibres a quarter of an inch in length, and finally deciduous. Their structure consists in a slender cellular axis, round which dichotomous, jointed, horizontal filaments are whorled. To these filaments the narrow obovate spores are attached. *Substance* cartilaginous, tender, becoming more rigid in the stem. The structure is cellular, the cells of the centre and those near the surface being minute; the intermediate ones large, lax, and polygonal. *Colour* when fresh, a clear olive, drying to a yellow green, and becoming brown in age. When young the plant adheres closely to paper in drying.



*Sporochnus pedunculatus*, though found in several widely separated places on the English and Irish coasts, is nowhere very common, and thus recommends itself by its rarity, as well as its beauty, to the collector. Few objects, indeed, are more attractive to the eye of a botanist than a fine frond of this species, as it waves its feathery branches in the water; but were the use of the dredge more general with algologists, this, and many other deep water plants, would, probably cease to be regarded as of rare occurrence; and we should be better acquainted with their habits, and the exact localities which they frequent. Most of the specimens now collected, are washed up by the tide, frequently in an imperfect, or decaying condition; or picked out of fishermen's nets, in the meshes of which they get entangled and torn. If raised by the dredge they would not only be found more perfect, but in far greater plenty.

Hudson was the first to describe this species, in his 'Flora Anglica.' It is of rare occurrence on the Continent, and has not been found out of Europe. Agardh regards as a distinct species, a Spanish plant which closely resembles it, and which differs chiefly from our *S. pedunculatus*, in the form of the receptacles. It is not improbable that this also may be found on our southern shores.

The genus *Sporochnus*, as now restricted, contains four or five species, none of which, except the present, have yet been found in Britain. They are natives of the warmer parts of the Temperate zones of both hemispheres, where they inhabit deep, quiet bays. Those of New Holland are of a much larger size than our British species, but have a very similar habit.

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Fig. 1. SPOROCHNUS PEDUNCULATUS:—the natural size. 2. Receptacles of different ages. 3, A filament from the same. 4. A transverse section of the stem:—all magnified.

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PLATE LVII.

GLOIOSIPHONIA CAPILLARIS, *Carm.*

GEN. CHAR. *Frond* cylindrical, tubular, gelatinous; the periphery composed of a thin stratum of longitudinal, interlaced fibres, clothed externally with short, horizontal, branched, moniliform filaments. *Fructification* spherical masses of spores (*favellidia*), immersed in the moniliform filaments, to whose bases they are attached. GLOIOSIPHONIA (*Carm.*) —from γλοῖος, *viscid*, and σίφων, a *tube*.

GLOIOSIPHONIA *capillaris*.

GLOIOSIPHONIA *capillaris*, *Carm. Alg. Appin. MS. Berk. Gl. of Br. Alg.* t. 17. f. 3. *Harv. in Mack. Fl. Hib.* part 3. p. 187. *Harv. Man.* p. 49. *Mc'Calla, Alg. Hib.*

MESOGLOIA *capillaris*, *Ag. Syst.* p. 51. *Harv. in Hook. Br. Fl.* vol. ii. p. 386.

GIGARTINA *capillaris*, *Lamour. Ess.* p. .

GIGARTINA *lubrica*, *Lyngb. Hyd. Dan.* p. 45. t. 12 (*Sec. Ag.*).

FUCUS *capillaris*, *Huds. Fl. Ang.* p. 591. *With.* vol. iv. p. 115. *Turn. Syn.* vol. ii. p. 370. *Hist.* t. 31. *E. Bot.* t. 2191.

HAB. On submarine rocks, growing in tide-pools, near low-water mark; frequently cast on shore from deeper water. Annual. Summer. At Sheerness, and in Devonshire and Cornwall, *Hudson*. Scarborough, *Sir T. Frankland*. Anglesea, *Rev. H. Davies*. Sidmouth and Meadfoot, *Mrs. Griffiths*. Bantry Bay, *Miss Hutchins*. Appin, *Captain Carmichael*. Glenarm, *Dr. Drummond*. Roundstone Bay, *Mr. Mc'Calla*. Howth and Balbriggan, *Miss Gower*. Saltcoats, on shale, *Rev. D. Landsborough*. Arran, *D. Landsborough, Jun.* Mount's Bay, *Mr. Ralfs*. Falmouth, *Miss Warren*. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain.

DESCR. *Root* a small disc. *Fronds*, several from the same base, from three to twelve inches in length, cylindrical, varying in diameter from a quarter of a line to a line and upwards, rising with an undivided stem which is thickest in the middle and gradually tapers to either end, being reduced at its apex to a capillary fineness. The stem is generally bare of branches for a short space above its base, varying in different specimens from half an inch to an inch and a half. From this point to its summit it is closely clothed with lateral branches, several times compounded until the ultimate ramuli are reduced to small setaceous processes. The lower branches are longest, the upper gradually diminishing in length and in composition, and the outline is consequently ovate-oblong. All are more or less quadrifarious, giving a bushy character to the frond, and all taper at the base and are attenuated at the apex. They are either opposite or alternate. The *frond* is tubular, either empty or filled with a watery gelatine. Its walls are composed of closely interwoven, branching, longitudinal fibres, through whose joints runs a

very narrow, coloured bag, and they are clothed externally with a pile of short, dichotomous, moniliform coloured filaments, which form the coat of the frond. *Fructification*; spherical masses of closely compacted, minute spores, abundantly scattered among the filaments of the periphery. *Colour* a fine, clear, rosy-crimson. *Substance* tender, slippery and gelatinous, very closely adhering to paper in drying.

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A highly beautiful plant, nearly related in affinity to the genus *Dudresnaia*, but, according to the views of the late Captain Carmichael of Appin, forming the type of a separate genus, which differs from *Dudresnaia* chiefly in having a tubular axis. The structure, as seen by the microscope, is very beautiful, and such that it is impossible to do it justice in drawing, the extreme lubricity and transparency of the parts being lost in a lithograph. The whole plant is very tender, and invested with a gelatinous pellicle, and each filament of which it is composed stands separated from its neighbour by a similar coating. These characters are lost in our plate, which is, in other respects, a faithful portrait.

*Gloiosiphonia capillaris* is one of those species which is rather uncertain in its appearance, being found in some seasons in considerable plenty, and not occurring again, sometimes, for several years. The causes of such temporary disappearances of certain sea plants are very obscure, and will probably long remain so. The most probable seem to be changes which may take place in the bottom of the sea by the shifting of sand or gravel, an overflowing of which would smother the vegetation, and would not afford sufficient stability for the roots of a new crop. In many instances this cause no doubt prevails. In some others, the difference of temperature, small as this is, of different seasons, appears to be the chief, or the only, cause of failure.

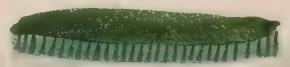
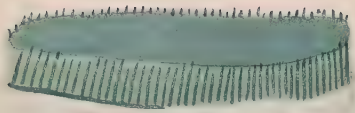
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Fig. 1. *GLOIOSIPHONIA CAPILLARIS*:—*natural size*. 2. A small branchlet. 3. Transverse section of the tubular frond. 4. A segment of the same, enlarged. 5. A longitudinal section of the frond:—*all more or less highly magnified*.

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## PLATE LVIII. A.

CALOTHRIX FASCICULATA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted, or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular *sporidia*. CALOTHRIX (*Ag.*)—from *καλὸς*, *beautiful*, and *θρίξ*, a *hair*.

CALOTHRIX *fasciculata*; stratum velvety, dark green, of indefinite extent; filaments very straight, subulate, much attenuated, fasciculately pseudo-branched.

CALOTHRIX *fasciculata*, *Ag. Syst.* p. 71 (*excl. syn.*). *Harv. in Hook. Br. Fl.* vol. ii. p. 368. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 158.

HAB. Spreading over the surface of marine rocks, about half-tide level; probably common. Annual? Found at all seasons. Miltown Malbay, *W. H. H.*

GEOGR. DISTR. Baltic Sea. British Islands.

DESCR. *Stratum* of indefinite extent, from a few inches to several feet in diameter, of a dark, shining green colour. *Filaments* from two to three lines in height, tufted, erect, straight, tapering to a long, setaceous, pellucid point. In an early stage of growth they are quite simple, and sometimes remain so, but more generally they are furnished with from two to six or more, erect, closely pressed pseudo-branches. *Striæ* or *annuli* strongly marked, and closely set. *Colour* under the microscope, a deep, glaucous green.

This is nearly related to *C. scopulorum*, which I have therefore figured on the same plate; and I am by no means sure that it should not be considered as merely a more developed form of that plant, the differences being occasioned by its growing at a greater depth, and in places where it is more constantly submerged. The filaments are taller, straighter, more acuminate, and of a deeper green than in *C. scopulorum*, and very frequently are furnished with tufts of accessory branches, but this is a character of minor importance.

The genus *Calothrix*, as defined by Agardh, contains many species, the majority of which, as of the *Oscillatorieæ* in general, are found in fresh water. By Kützing this genus has been broken up into several, and formed into a distinct family, an innovation of very questionable character, productive of a host of new synonymes.

A. Fig. 1. CALOTHRIX FASCICULATA. Portion of the stratum:—*the natural size*. 2. A tuft of filaments. 3. Apex of a filament:—*magnified*.

PLATE LVIII. B.

CALOTHRIX SCOPULORUM, *Ag.*

CALOTHRIX *scopulorum*; stratum velvety, dirty green, of indefinite extent; filaments flexuous, subulate, sub-attenuated, simple.

CALOTHRIX *scopulorum*, *Ag. Syst.* p. 70. *Harv. in Hook. Br. Fl.* vol. ii. p. 368. *Harv. in Mack. Fl. Hib.* part 3. p. 237. *Harv. Man.* p. 157.

OSCILLATORIA *scopulorum*, *Ag. Syn.* p. 111. *Hook. Fl. Scot.* part 2. p. 79. *Grev. Fl. Edin.* p. 304.

CONFERVA *scopulorum*, *Web. et Mohr, Reis.* p. 195. t. 3. f. *a, b.* *Roth. Cat. Bot.* vol. iii. p. 191. *Dillw. Conf. Introd.* p. 39. *Suppl. t. A. E. Bot.* t. 2171.

HAB. On marine rocks, near high water mark. Common.

GEOGR. DISTR. Shores of Europe; and probably dispersed throughout the temperate zones.

DESCR. *Stratum* of indefinite extent, dark, dirty green, slippery. *Filaments* a line in height, flexuous, often very much curled, subulate, tapering to a more or less acute point, crowded, tufted, the tufts glued together at the base by a slimy matter, simple. *Striæ* sometimes indistinct; sometimes well-defined and very close. *Colour*, under the microscope, a dull, yellowish green.

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This forms slimy patches, very treacherous to unwary feet, on the surface of rocks near high-water mark, often growing in places where it is only wet by the splashing of the sea, or only covered at spring tides, and where it is much within the influence of rain. It is found on all our shores, on rocks of every geological character indifferently, and is probably to be met with in similar situations all over the world. It was first detected in Sweden, by Weber and Mohr, and introduced to the notice of British botanists by Mr. Dillwyn.

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B. Fig. 1. CALOTHRIX SCOPULORUM. Portion of the stratum:—*the natural size.*  
2. A tuft of filaments. 3. Apex of a filament:—*both magnified.*

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## PLATE LIX.

DUMONTIA FILIFORMIS, *Grev.*

GEN. CHAR. *Frond* cylindrical, membranaceous, filled with watery gelatine, tubular; its walls composed externally of minute roundish cells, internally of elongated cellules, disposed in filaments. *Fructification* of two kinds, on distinct individuals; 1, roundish *tetraspores* immersed in the surface cellules; 2, clusters of obovate *spores* attached to the inner surface of the membrane of the frond. DUMONTIA (*Lamour.*)—in honour of *M. Dumont*, a French naturalist.

DUMONTIA *filiformis*; frond undivided, attenuated to each extremity, pinnated with long, simple, tapering branches.

DUMONTIA *filiformis*, *Grev. Alg. Brit.* p. 165. t. xvii. *Hook. Br. Fl.* vol. ii. p. 308. *Wyatt, Alg. Danm.* no. 31. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 51. *Hook. fl. Fl. Ant.* part i. p. 189. *Kütz. Phyc. Gen.* p. 394. t. 74. f. 2. *Endl. 3rd Suppl.* p. 39.

DUMONTIA *incrassata*, *Lam. Ess.* p. 45.

HALYMENIA *filiformis*, *Ag. Sp. Alg.* vol. i. p. 214. *Syst.* p. 245.

CHONDRIA *purpurascens*, *Grev. Fl. Edin.* p. 290.

GASTRIDIDIUM *filiforme*, *Lyngb. Hyd. Dan.* p. 68. t. 17.

CONFERVA *filiformis*, *Fl. Dan.* t. 1480. f. 2.

ULVA *filiformis*, *Wahl. Fl. Lapp.* p. 508.

Var.  $\beta$ . *crispata*; frond broad, compressed, waved, curled and twisted.

DUMONTIA *filiformis*  $\beta$ . *crispata*, *Grev. Alg. Brit.* p. 165. *Harv. l. c.*

HALYMENIA *purpurascens*  $\beta$ . *crispata*, *Grev. Crypt.* t. 240.

HAB. On rocks and stones in the sea, at half-tide level. Annual. Summer.  $\beta$ . in places exposed to tidal currents. Common.

GEOGR. DISTR. Shores of Europe. Southern Ocean.

DESCR. *Root*, a small disc. *Fronds* solitary or tufted, from one to twenty inches in length, and from a tenth of an inch to half an inch in width, cylindrical or compressed, tubular, with an undivided stem furnished with alternate or irregularly disposed, lateral, simple branches; both stem and branches tapering at the base, and much attenuated towards the extremities, more or less waved, and flexuous. Sometimes the main stem is short, and comparatively slender; the branches being much longer, and of greater diameter: sometimes the branches are short, and the stem long. In almost all cases the tube is unequally distended or wavy, a peculiarity which in var.  $\beta$ . is very much exaggerated. In this the frond is much twisted, often in a strong spiral, and the membrane excessively curled and puckered. *Fructification*; 1, *tetraspores* (which I have not seen); and clusters of obovate *spores* attached to the inner surface of the tube, abundantly produced in summer. *Substance* membranaceous, gelatinous within, adhering to paper in drying.



The *colour* varies from pale yellowish, in shallow water, to various degrees of livid purple, in deeper and more shaded situations. In fresh water the plant soon decomposes, giving out a pinkish dye of some brilliancy.

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A very common plant, and one which, though tolerably constant to a particular ramification, having long simple branches springing from a simple stem, is yet subject to many modifying causes, which affect its habit, and general appearance very considerably. The variety  $\beta$ , an excellent figure of which is given by Dr. Greville, in his 'Crypt. Flora,' differs extremely from the normal form, represented in our plate. In it, the frond is often an inch in diameter, and so much puckered and waved, that, except in colour, it strongly resembles *Enteromorpha intestinalis*. Yet this variation appears to arise solely from locality, being always found where a strong stream rolls down.

*Dumontia filiformis* is widely dispersed in the temperate zones, and was found by Dr. Hooker, both in the Auckland group of Islands, and at the Falklands. Throughout Europe it is extremely common. There are several other species of the genus, many of which are found in the Kamtschatkan seas, and along the opposite coast of America. One of them, *D. saccata*, which has a simple, bag-like frond, is found, if all the plants which go under this name belong to one species, in localities nearly as widely apart as is *D. filiformis*, occurring on the west coast of America, and at the Cape of Good Hope. Another species, *D. prismatica*, J. Ag., inhabits the Indian Ocean. But the generic characters of several of the reputed species, require examination, and, probably, many will eventually be removed to new genera.

The *Dumontiæ* are the most simple in structure of the *Gastero-carpeæ*, in which they represent such plants as *Enteromorpha*, *Asperococcus*, &c. They are also found at a higher level than any others of their family, some of them growing, as our common one occasionally does, nearly at high water mark.

Kützing figures and describes *tetraspores* on this species, but I have not had the good fortune to find them. The clustered spores are common.

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Fig. 1. *DUMONTIA FILIFORMIS* :—*natural size*. 2. Portion of the frond, showing a front view of a cluster of spores, attached to the inner surface. 3. Lateral view of the same cluster, and vertical section of the wall of the frond :—*magnified*.

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## PLATE LX.

CYSTOSEIRA GRANULATA, *Ag.*

GEN. CHAR. *Fronde* much branched, occasionally leafy at the base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within their substance. *Receptacles* terminal, small, cellular, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. CYSTOSEIRA (*Ag.*)—from κύστις, a *bladder*, and σείρά, a *chain*; because the air vessels are generally arranged in strings.

CYSTOSEIRA *granulata*; stem cylindrical, covered with elliptical knobs, each of which bears a slender, repeatedly divided, dichotomo-pinnate, filiform branch, irregularly set with scattered, awl-shaped, thorn-like ramuli; air vessels small, two or three together in the upper part of the branches; receptacles elongated.

CYSTOSEIRA *granulata*, *Ag. Sp. Alg.* vol. i. p. 55. *Syst.* p. 282. *Grev. Fl. Edin.* p. 285. *Grev. Alg. Brit.* p. 5. t. 2. *Hook. Br. Fl.* vol. ii. p. 265. *Harv. in Mack. Fl. Hib.* part 3. p. 167. *Wyatt, Alg. Danm.* no. 101. *Harv. Man.* p. 18. *Endl. 3rd Suppl.* p. 30.

FUCUS *granulatus*, *Lin. Sp. Pl.* p. 1629. *Fl. Dan.* t. 591. *Turn. Hist.* t. 251. *E. Bot.* t. 2169. *Hook. Fl. Scot.* part 2. p. 94. *Lyngb. Hyd. Dan.* p. 58.

FUCUS *concatenatus*, *Lin. Sp. Pl.* p. 1629. *Huds. Fl. Ang.* p. 574. *Lightf. Fl. Scot.* vol. ii. p. 923. *Clem. Ess.* p. 310. *Velley, Pl. Mar.* t. 2. f. 1.

FUCUS *mucronatus*, *Turn. Syn.* vol. i. p. 78.

FUCUS *nodicaulis*, *With.* vol. iv. p. 111.

PHYLLACANTHA *Boryana* (?), *Kütz. Phyc. Gen.* p. 355 (and probably several other species of *Phyllacantha*, *Kütz.*).

HAB. In rocky basins left by the tide, at and below half-tide level. Perennial. Summer. Not uncommon on the shores of England and Ireland. Aberfraw, *Mr. Ralfs*. Rare in Scotland? Jersey, *Miss White*.

GEOGR. DISTR. Shores of Europe from Norway to Spain.

DESCR. *Root* a depressed, conical disc. *Stem* cylindrical, two to four lines in diameter, and from two to ten inches in length, more or less densely covered with quadrifarious, elliptical knobs, each of which produces a branch, several inches to a foot or more in length. *Branches* filiform, slender, much divided in a manner between dichotomous and alternately pinnate; the smaller branches twice or thrice compound. *Air-vessels* innate in the branches, often below an axil, or two or three together in the alternate branchlets, elliptic-oblong. Axils obtuse. *Ramuli* scattered along the receptacles and branches, small, spine-like, acute. *Receptacles* lanceolate, unequally tubercled. *Substance* leathery, horny when dry. *Colour* a clear olive-green, in age becoming brown or foxy.

From the other British species of *Cystoseira*, except from *C. barbata*, which has probably no claim to be admitted as British, *C. granulata* may be readily known by the knob-like bases of its branches, a character at all times obvious. Like its congeners it is exceedingly bushy, forming a submarine shrub, and I have been forced, in making such a figure as would detail its botanical characters, to represent a specimen with most of its branches cut off. Had I attempted more, it would only have produced a confused mass of twigs.

*C. granulata* is of frequent occurrence on the shores of England and of Ireland, but appears to be rare in Scotland. It generally grows in a very scattered manner, but is sometimes gregarious. Like others of the genus its stems afford a grateful resting place to a host of marine animals, sponges, &c., and are often completely clothed with a thick incrustation of animal life. However annoying this may be to the collector of specimens, who can rarely, if ever, find a clean-stemmed *Cystoseira*, it must be admitted that these parasites add much to the picturesque beauty of a *Cystoseira* grove, their brilliant colours and starry forms looking like clusters of flowers peeping out from the branches. When seen, under a favourable light, in a clear tide-basin, the effect is highly beautiful.

The genus *Cystoseira*, in its most restricted sense, even after the removal of the extensive group now forming *Blossevillea*, Dne., still contains a considerable number of species, natives, for the most part, of the warmer regions of the temperate zones. Many are found in the Mediterranean; indeed, the greater part of the *Fuceæ* found in that sea belong to this genus. They are intermediate, as well in geographical position as in distinctive character, between the tropical *Sargassa*, which they resemble in the *structure* of their fruit, and in habit; and the *Fuci* of colder waters, with which they agree in the *position* of the fruit and vesicles. Through *Blossevillea* there is a direct passage into *Sargassum*; the connection with *Fucus* is more remote, and runs through some minor genera, natives of the Southern Ocean.

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Fig. 1. CYSTOSEIRA GRANULATA:—*natural size*. 2. Section of a receptacle:—*magnified*. 3. Spore:—*highly magnified*.

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## PLATE LXI.

SPHÆROCOCCLUS CORONOPIFOLIUS, *Ag.*

GEN. CHAR. *Frond* cartilaginous, compressed, two-edged, linear, distichously branched, with an internal rib, cellular; central cells fibrous; medial polygonal; those of the periphery minute, disposed in filaments. *Fructification*; 1, spherical *tubercles* (*coccidia*) having a thick, fibro-cellular pericarp, and containing a mass of minute spores on a central placenta; 2, *tetraspores*? (unknown). SPHÆROCOCCLUS (*Stack.*)—from *σφαῖρα* a *sphere* or *globe*, and *κόκκος*, *fruit*.

SPHÆROCOCCLUS *coronopifolius*; frond very much branched, branches alternate or subdichotomous, fan-shaped, multifid, ending in acute laciniae, fringed with cilia; tubercles immersed in the cilia.

SPHÆROCOCCLUS *coronopifolius*, *Ag. Sp. Alg.* vol. i. p. 291. *Ag. Syst.* p. 229. *Grev. Alg. Brit.* p. 138. t. 15. *Hook. Br. Fl.* vol. ii. p. 304. *Harv. in Mack. Fl. Hib.* part. 3. p. 203. *Wyatt, Alg. Danm.* n. 122. *Harv. Man.* p. 79. *J. Ag. Alg. Medit.* p. 154. *Endl. 3rd Suppl.* p. 52.

GELIDIUM *coronopifolium*, *Lamour. Ess.* p. 41.

RHYNCHOCOCCUS *coronopifolius*, *Kütz. Phyc. Gen.* p. 403. t. 61. f. 1.

FUCUS *coronopifolius*, *Good. et Woodw. in Linn. Trans.* vol. iii. p. 185. *Stack. Ner. Brit.* p. 82. t. 14. *Turn. Syn.* vol. ii. p. 288. *Turn. Hist.* t. 122. *E. Bot.* t. 1478. *Esper, Ic.* p. 60. t. 138. *Lamour. Dis.* t. 33.

FUCUS *coronopi facie*, *Raii Syn.* p. 45. n. 23.

FUCUS *cartilagineus*, *Huds. Fl. Ang.* p. 586 (*not of Linn.*). *Desf. Fl. Atlant.* p. 425.

HAB. On rocky sea shores, at extreme low-water mark, and at a greater depth; mostly cast on shore after a gale. Perennial. Summer and Autumn. Frequent on the southern shores of England, and southern and western shores of Ireland. Belfast Bay, *Mr. Templeton*. Larne, *Dr. Drummond*. Very rare in Scotland; Bute *Dr. Greville*. Ardrossan, Kilbride, and Arran, *Rev. D. Landsborough*. Jersey, *Miss Turner* and *Miss White*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* a flattish disc. *Fronds* from six to twelve or even eighteen inches in length, from two to four lines in width, very much branched, distichous; the main stems compressed, thickened and two-edged below, becoming thinner and flatter in their upper parts, irregularly divided in a manner between dichotomous and alternate, the upper branches once or twice forked, gradually narrower, and ending in fan-shaped many-cleft lesser branches. *Laciniae* tapering to an acute point, their margins, and sometimes those of the older parts of the frond, fringed with slender cilia from half a line to a line in length, simple, acute, and spreading, in some of which *tubercles* are imbedded. *Tubercles* spherical, imbedded in the cilia below the apex, which

is slightly produced beyond them, forming an oblique mucro; their walls very thick, the inner portion formed of largish, polygonal cells, the outer of a stratum of closely packed vertical filaments. A very dense, broad, more or less clearly defined, sometimes obsolete mid-rib runs through the substance of the frond, and faint lateral, oblique veins proceed from it; both formed of elongated, cylindrical cellules, disposed in longitudinal fibres. The cells composing the middle stratum of the frond are polygonal, gradually becoming smaller outwards; and those of the periphery are very minute, and arranged in closely packed, vertical filaments. *Colour* a fine scarlet pink, dark in the main branches. *Substance* cartilaginous, imperfectly adhering to paper in drying.

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In reforming the genus *Sphærococcus*, which, in the work of Agardh included a large number of species now dispersed into many genera, and many of which had little in common with each other except the spherical fruit, Dr. Greville confined the amended genus to the *S. coronopifolius* and to *S. crinitus*, Gm. The first of these, being the best known, is to be considered the type. Its structure is peculiar; under a pocket lens may be observed running through the branches the faint appearance of a mid-rib, connected with the margin by oblique lateral veins, both of which were first observed by Mr. Sowerby. By making a transverse section, and applying a more powerful glass, this venation is seen to be caused by an internal rib, composed of denser and more elongated cells than the rest of the frond; and if the internal structure of the frond affords, in the Florideæ, the surest generic characters, the presence of such a rib ought to be essential to the genus. Judged by this rule, my *S. australis* (Harv. in Hook. Lond. Journ. vol. iii. p. 445), notwithstanding that outwardly it bears a close resemblance to *S. coronopifolius*, must be removed from the genus, its internal structure being extremely lax, and more like that of *Gracilaria*, a group which, if allowed to retain all the species which seem disposed to drop into it, will soon be as anomalous as *Sphærococcus* was formerly.

*S. coronopifolius* appears to have been first noticed by Ray, in whose 'Synopsis' it is described. It is said to be unknown on the eastern coast of England. In Ireland it is more common, and is found at both sides of the island. In Scotland it is extremely rare.

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Fig. 1. SPHÆROCOCCUS CORONOPIFOLIUS:—*natural size*. 2. Portion of a branchlet. 3. Section of a tubercle. 4. Spores. 5. Cross section of a main branch, in its lower part. 6. Longitudinal section of the same:—*all more or less highly magnified*.

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## PLATE LXII.

LYNGBYA MAJUSCULA, *Harv.*

GEN. CHAR. *Filaments* destitute of a mucous layer, free, flexible, elongated, decumbent, not oscillating. *Tube* continuous; endochrome green or purple, densely annulated, and finally separating into lenticular *sporidia*. LYNGBYA (*Ag.*) in honour of *Hans Christian Lyngbye*, author of an excellent work on the Algæ of Denmark.

LYNGBYA *majuscula*; tufts of large size; filaments very thick, issuing in long, crisped bundles, from a blackish-green stratum, twisted, simple or slightly pseudo-branched.

LYNGBYA *majuscula*, *Harv. in Hook. Br. Fl.* vol. ii. p. 370. *Harv. in Mack. Fl. Hib.* part. 3. p. 238. *Wyatt, Alg. Danm.* no. 147. *Harv. Man.* p. 160.

LYNGBYA *crispa*, *Ag. Syst.* p. 74 (*in part*).

CONFERVA *majuscula*, *Dillw. Conf. Suppl.* t. A.

HAB. On mud-covered, or sand-covered rocks in the sea, at and below half-tide level; thrown up after storms, from deep water. Annual. Summer and Autumn. Santon Sands, *Miss Hill*. Bantry Bay, *Miss Hutchins*. Torbay, *Mrs. Griffiths*. Belfast Bay, *Dr. Drummond*. Port Rush, *Mr. Moore*. Ilfracombe, and Mount's Bay, *Mr. Ralfs*. Jersey, *Miss White*.

GEOGR. DISTR. Shores of the British Islands.

DESCR. *Filaments* collected into widely spreading, blackish green, glossy strata, of several inches in diameter, which lie on the surface of flat rocks, or on the sands; at length rising to the surface and floating to the shore. In these strata the filaments are densely interwoven, and issue from the upper surface, and from the edges, in crisped bundles, one to two inches long. They are very tortuous, simple, or now and then cohering together, as if branched, and are of greater diameter than those of any other species of this genus, twice or thrice as thick as those of *L. muralis*. The endochrome is of dull, glaucous green; the annuli closely set; and the border of the tube broad and colourless. Sometimes the endochrome is interrupted at intervals, as if broken; and sometimes it separates as by a distinct articulation, into two portions, and it is probable that at a more advanced period the uppermost portion further separates from the lower, and becomes a new filament.

This is the largest growing, and strongest species of the genus, and in favourable situations becomes quite a handsome plant, resembling in all but colour, fine tufts of curling hair. But if we suppose it to have belonged to a sea nymph, the dark green hue is not so inappropriate.



*Lyngbya majuscula* was discovered by Miss Hill, early in the present century, and first described by Dillwyn, in his work on the British Confervæ. It is well known to British naturalists, and has been found in several localities on our shores; but on the Continent it appears to have escaped notice. Agardh quotes Dillwyn's figure under his *L. crispa*, a plant, which, to judge by a specimen communicated by Agardh himself to Sir Wm. J. Hooker, is a very different plant, having a verdigris-green colour, and being thrice as slender.

As a genus, *Lyngbya* is intermediate between *Oscillatoria* and *Calothrix*. From the first it differs, by having long, flexible filaments, destitute of oscillatory motion; and from the latter, by its stratified habit. There are several species, the most common of which is a terrestrial one (*L. muralis*), which forms a silky stratum of a brilliant green colour on the surface of damp ground, and abounds everywhere, and at all seasons. The major part of the species, are, however, marine; and, besides the present individual, three others are found on our coasts, and will be figured in a future number.

The genus *Bangia* has many points in common with *Lyngbya*, and is even united to it by Mr. Hassall, but if these genera are to be combined, *Bangia*, being the older name, must be adopted.

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Fig. 1. *LYNGBYA MAJUSCULA*; Part of a stratum:—*natural size*. 2. Apices of two filaments:—*highly magnified*.

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PLATE LXIII.

CHONDRUS CRISPUS, *Lyngb.*

GEN. CHAR. *Frond* cartilaginous, nerveless, compressed or flat, flabelliform, dichotomously cleft; formed internally of three strata; the *inner*, of densely packed, longitudinal fibres; the *medial*, of small, roundish cells; the *outer*, of vertical, coloured, moniliform filaments. *Fructification*; 1, prominent *tubercles* (*nemathecia*) composed of radiating filaments, whose lower articulations are at length dissolved into *spores* (?); 2, *tetraspores* collected into sori, immersed in the substance of the frond. CHONDRUS (*Stack.*)—from *χόνδρος*, *cartilage*.

CHONDRUS *crispus*; frond stipitate, thickish, cartilaginous, flat or curled, segments wedge-shaped, very variable in breadth; apices truncate, subemarginate or cloven; axils obtuse; sori elliptical or oblong, concave on one side.

CHONDRUS *crispus*, *Lyngb. Hyd. Dan.* p. 15. t. 5. A. B. *Grev. Alg. Brit.* p. 129. t. 15. *Hook. Br. Fl.* vol. ii. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 201. *Wyatt, Alg. Danm.* no. 118 and 119. *Endl. 3rd Suppl.* p. 39. *Harv. Man.* p. 77. *Kütz. Phyc. Gen.* p. 398. t. 73. iii.

CHONDRUS *polymorphus*, *Lamx. Ess.* p. 39.

CHONDRUS *incurvatus*, *Kütz. Phyc. Gen.* p. 399. t. 73. ii.

CHONDRUS *celticus*, *Kütz. l. c.*

SPHÆROCOCCLUS *crispus*, *Ag. Sp. Alg.* vol. i. p. 256. *Syst.* p. 219. *Grev. Fl. Edin.* p. 294. *Spreng. Syst. Veg.* vol. iv. p. 335.

FUCUS *crispus*, *Linn. Mant.* p. 134. *Syst. Nat.* vol. ii. p. 718. *With.* vol. iv. p. 106. *Stack. Ner. Brit.* p. 63. t. 12. *Turn. Syst.* vol. ii. p. 226. *Hist.* t. 216, 217. *Clem. Ess.* p. 313. *Wahl. Fl. Lapp.* p. 497. *E. Bot.* t. 2285.

FUCUS *ceranoides*, *Gm. Hist. Fuc.* p. 115. t. 7. f. 1. (*Excl. syn. Linn.*). *Huds. Fl. Ang.* p. 582. *Lightf. Fl. Scot.* p. 913. *Roth, Fl. Germ.* vol. iii. p. 450. *Esper, Ic. Fuc.* vol. i. p. 143. t. 98. f. 1, 2, 3.

FUCUS *membranifolius*, *With.* vol. iv. p. 106 (not of *Gooden. and Woodw.*).

FUCUS *polymorphus*, *Lamx. Diss.* p. 1. (excluding the fourth series).

FUCUS *stellatus*, *Stack. Ner. Brit.* p. 53. t. 12.

FUCUS *lacerus*, *Stack. l. c.* p. 50. t. 11.

FUCUS *crispatus*, *Fl. Dan.* t. 826.

FUCUS *filiformis*. *Huds. Fl. Ang.* p. 585.

FUCUS *patens*, *Gooden. and Woodw. in Linn. Trans.* vol. iii. p. 173.

HAB. On rocky sea shores, extending from three quarters tide level to low water mark, and beyond it. Perennial. Spring and Summer. Very abundant on the shores of the British Islands.

GEOGR. DISTR. Shores of Europe from North Cape to Gibraltar. Not found in the Mediterranean? Eastern shores of North America.

DESCR. *Root*, a flattened disc. *Fronde*s tufted, many springing from the same base, from one to ten or twelve inches in height, rising with a subcylindrical, slender stem, which soon becomes flattened, and at an inch or more from the root widens into the cuneate base of a fan-shaped, many parted frond. The segments vary much in width, and in the amount of their furcation. Sometimes they are not more than a line wide, nearly perfectly linear, flat, and very many times dichotomous; sometimes they are from one to four inches in breadth, very much curled, and broadly cuneate, overlapping each other. Sometimes the margin is quite entire and even; in other specimens it is lobed, or proliferous, or fringed with leafy processes. The apices are more or less truncate, emarginate or bifid; and the axils, especially of the broad varieties, are very blunt. The *colour* is extremely variable, ranging from a yellowish green to a livid purple, or a purplish-brown. *Fructification*; *tetraspores* collected in dense sori, contained in oval or oblong cavities irregularly scattered through the lamina of the frond, and usually concave on one side. *Substance* cartilaginous, becoming soft, and finally dissolving into a gelatine in fresh water.

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So variable is the present species in appearance, under different circumstances, that it is quite impossible to enumerate the many forms it puts on, and were we to attempt to figure even the principal varieties, the figures would fill many plates. Turner has ten varieties; and Lamouroux figures thirty-five. I prefer representing two of the most opposite forms.

My upper figure shows the state of the plant when growing near low water mark, in situations exposed to the full dash of the open sea. The lower is from an estuary where a fresh water stream mixes with the sea, and brings down much mud and sand. In this situation the *Chondrus* attains even a greater size, and is frequently very much lobed and fringed.

This plant is the *Carrigeen* or Irish moss of the shops, and is used in place of isinglass in the preparation of blanc-manges, and jellies, the frond boiling down to a clear, tasteless gelatine. A few years ago it was a fashionable remedy in consumptive cases, and the collection and preparation of it for market afforded a small revenue to the industrious peasantry of the West Coast of Ireland, where it first came into use. The price at one time was as high as 2s. 6d. per lb., but the fashion has gone out, and the plant almost ceased to be collected.

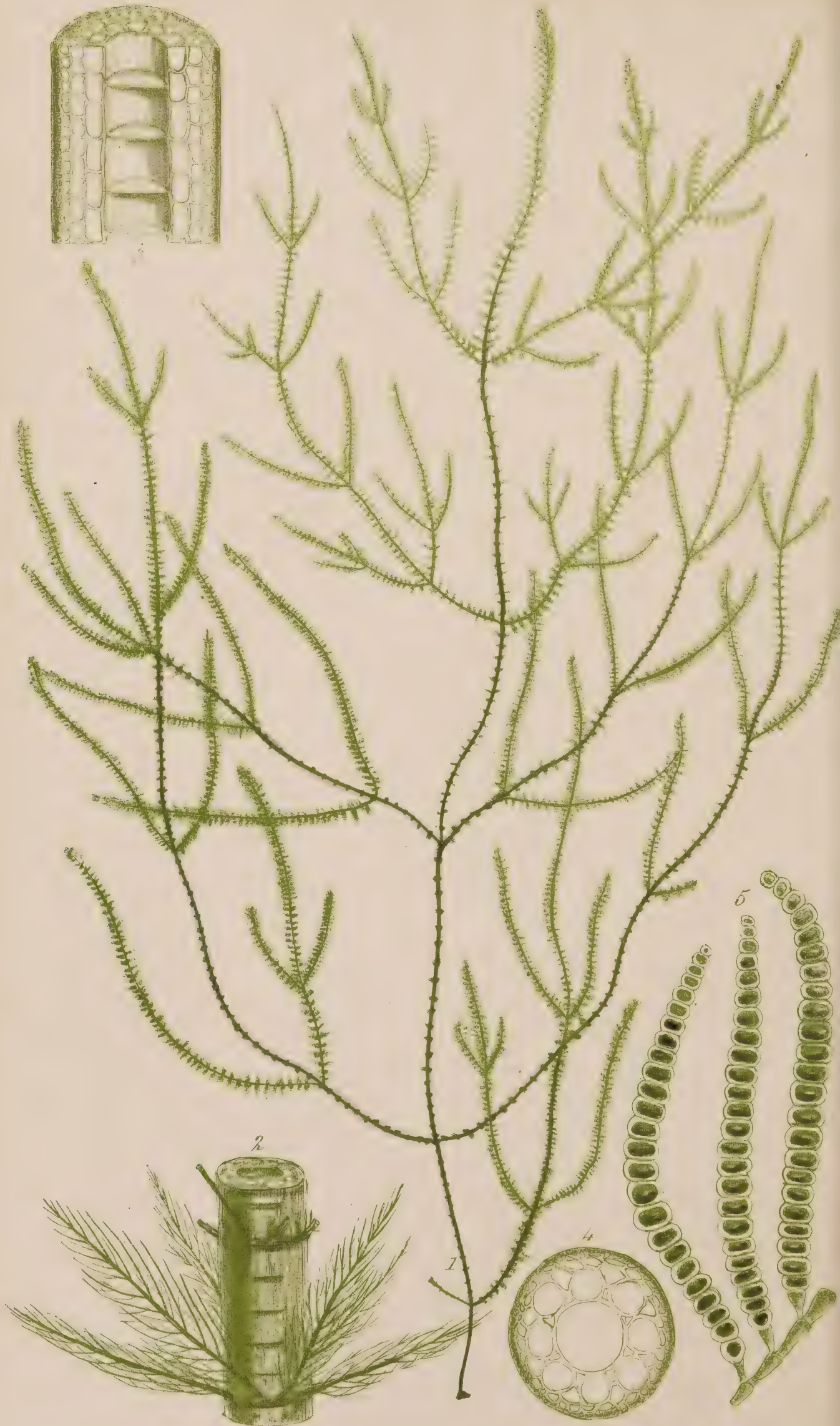
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Fig. 1. *CHONDRUS CRISPUS*, a *narrow* variety. 2. The same, a *broad* variety:—*natural size*. 3. Transverse section of the frond. 4. Longitudinal section:—both *magnified*. 5. Specimen producing *sori*:—*natural size*. 6. Transverse section of the frond, and of two sori. 7. Tetraspores from the sorus:—both *magnified*.

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## PLATE LXIV.

ARTHROCLADIA VILLOSA, *Duby*.

GEN. CHAR. *Fronde* filiform, cellular, with an articulated, tubular axis, nodose; the nodes producing whorls of delicate, jointed filaments. *Fructification*; pedicellate, moniliform pods, borne on the filaments, and containing, at maturity, a string of elliptical spores. ARTHROCLADIA (*Duby*)—from ἀρθρον, a joint, and κλάδος, a branch.

## ARTHROCLADIA villosa.

ARTHROCLADIA villosa, *Duby*, *Mem. Ceram.* p. 18 (1832). *J. Ag. Alg. Medit.* p. 43. *Endl. 3rd Suppl.* p. 25. *Kütz. Phyc. Gen.* p. 344.

ELAIONEMA villosum, *Berk. Glean.* p. 49. t. 19. f. 3 (1833). *Harv. Man.* p. 28.

SPOROCHNUS villosus, *Ag. Sp. Alg.* vol. i. p. 155. *Ag. Syst.* p. 260. *Grev. Alg. Brit.* p. 42. *Hook. Br. Fl.* vol. ii. p. 274. *Wyatt, Alg. Danm.* no. 105. *Harv. in Mack. Fl. Hib.* part 3. p. 173.

CONFERVA villosa, *Huds. Fl. Ang.* p. 603. *With.* vol. iv. p. 141. *E. Bot.* t. 546. *Dillw. Conf.* t. 37. *Roth. Cat. Bot.* vol. iii. p. 314.

HAB. On submarine rocks, shells, &c., and on *Zostera*, in four or five fathoms water, rare. Annual. Summer and Autumn. Southern coasts of England, not uncommon. Yarmouth, *Turner*. Anglesea, *Rev. H. Davies*. Frith of Forth, *Mr. Hasell*. Ardruth, *Capt. Carmichael*. Wicklow, *W. H. H.* Malahide, and Carrickfergus, *Mr. McCalla*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Baltic sea. Mediterranean sea, (very rare).

DESCR. *Root*, a minute disc. *Fronde*s several from the same base, from six inches to nearly three feet in length, very slender, once, twice, or thrice pinnated; the pinnæ distant, opposite, or rarely alternate, patent, simple or again pinnated with similar, simple pinnules; all the branches furnished at intervals of from half a line to a line, with minute, knob-like swellings which produce whorls of very delicate, byssoid, repeatedly pinnate jointed filaments of a pale green colour. The substance of the frond is traversed by a wide tube, about one third of the width, which is divided by transverse septa into joints or chambers, whose length is rather less than their breadth, and four or five of which interpose between every whorl of filaments. This tube is surrounded by a row of large cellules, and these again by several rows of smaller ones, which gradually diminish to the circumference. The substance when quite fresh is cartilaginous, but it soon becomes flaccid. *Fructification*; minute, articulated, lanceolate pods (*stichidia*) borne along the sides of the whorled filaments; at first short, finally much lengthened, moniliform, and containing, at maturity, in each joint, an oval spore of an olive colour, which at length bursts through the membrane and falls away. In drying it adheres firmly to paper.



This elegant plant, which was formerly included in the genus *Sporochnus*, was, nearly at the same time, by M. Duby in France, and by the Rev. M. J. Berkeley in this country, proposed as the type of a distinct genus. M. Duby's name, having the priority of a few months, is here adopted. Of the propriety of constituting a new genus in this instance, there can be no question, both the structure of the frond, and the nature of the fructification being very unlike that of the *Sporochni*. There is, indeed, a much closer connection with *Desmarestia*, both in habit and in structure, and it is very probable that the fruit of *Desmarestia* may prove to be analogous to that of the present genus. At a first glance the difference in the structure of the frond between *Desmarestia* and *Arthrocladia* appears considerable, but a closer examination removes much of the dissimilarity. A jointed tube runs through the centre of both fronds; in the *Desmarestia*, in the form of a slender filament; in the *Arthrocladia* of a wide tube. The confervoid filaments are of the same nature in both genera, and the branching of the fronds identical. The great difference lies in the comparative density of structure.

Dr. Greville mentions that Mr. Hasell, the discoverer of *A. villosa* in Scotland, observed that "fresh specimens when spread upon paper, rendered it transparent, as if it had been touched with oil; but in a very short time the transparency quite disappeared." This property is not peculiar to this species, but exists also in young specimens of *Desmarestia ligulata*, and *D. herbacea*, and perhaps of others of the family, and affords another evidence of the strong natural connection of these plants. Another common point of resemblance consists in their soon becoming flaccid and changing to a verdigris green colour on exposure to the atmosphere, and then causing the rapid decomposition of any other delicate Alga in contact with them. This is common to all the *Sporochnoideæ*.

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Fig. 1. *ARTHROCLADIA VILLOSA* :—*natural size*. 2. Part of a branch, showing a whorl of filaments. 3. Longitudinal section of the frond. 4. A transverse section of the same. 5. Pods of fructification :—*more or less highly magnified*.

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## PLATE LXV.

GRACILARIA CONFERVOIDES, *Grev.*

GEN. CHAR. *Fron*d filiform or rarely flat, carnosocartilaginous, continuous, cellular; the central cells very large, empty, or full of granular matter; those of the surface minute, forming densely packed, vertical filaments. *Fructification* of two kinds, on distinct individuals; 1, convex *tubercles* (*coccidia*) having a thick pericarp composed of radiating filaments, containing a mass of minute spores on a central placenta; 2, *tetraspores* imbedded in the cells of the surface. GRACILARIA (*Grev.*)—from *gracilis*, slender.

GRACILARIA *confervoides*; frond cartilaginous, cylindrical, filiform, irregularly (often very slightly) branched; branches long, subsimple, erect; ramuli few, tapering at each end; tubercles scattered, sessile, roundish, subacute.

GRACILARIA *confervoides*. *Grev. Alg. Brit.* p. 123.

HYPNEA *confervoides*, *J. Ag. Alg. Medit.* p. 149. *Endl. 3rd Suppl.* p. 50.

SPHÆROCOCCLUS *confervoides*, *Ag. Sp. Alg.* vol. i. p. 303. *Syst.* p. 232. *Spreng. Syst. Veg.* vol. iv. p. 338. *Kütz. Phyc. Gen.* p. 408. t. 60. iii.

GIGARTINA *confervoides*, *Lamx. Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 43. *Hook. Brit. Fl.* vol. ii. p. 299. *Wyatt, Alg. Danm.* no. 75. *Harv. in Mack. Fl. Hib.* part 3. p. 200. *Harv. Man.* p. 74.

FUCUS *confervoides*, *Linn. Sp. Pl.* p. 1629. *Syst. Nat.* vol. ii. p. 719. *With.* vol. iv. p. 114. *Turn. Syn.* vol. ii. p. 328. *E. Bot.* t. 1668. *Turn. Hist.* t. 84. *Esper, Ic. Fuc.* vol. i. p. 136. t. 68. *Stack. Ner. Brit.* p. 96. t. 15.

FUCUS *longissimus*, *Gm. Hist.* p. 134. t. 13. *Stack. Ner. Brit.* p. 99. t. 16.

FUCUS *verrucosus*, *Huds. Fl. Ang.* p. 588. *Gm. Hist.* 136. t. 14. f. 1. *Stack. Ner. Brit.* p. 26. t. 8.

FUCUS *albidus*, *Huds. Fl. Ang.* p. 588 (*Excel. Syn. Raii.*) *Good. and Woodw. in Linn. Trans.* vol. iii. p. 210. *Esper, Ic.* p. 147. t. 100. *With.* vol. iv. p. 118.

FUCUS *flagellaris*, *Esper, l. c.* t. 105.

HAB. On rocks and stones in the sea, near low water mark, and at a greater depth. Perennial. Summer and Autumn. Not uncommon on the British coasts. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic Ocean, from the British shores to those of North Africa. North Sea, very rare. Mediterranean Sea.

DESCR. *Root*, a small disc, accompanied by fibres. *Fron*ds one or several from the same base, from three to twenty inches in length, cylindrical, as thick as small twine, gradually tapering towards the apex to a long, subulate point, very irregularly branched. Some specimens divide near the base into a few, long, simple, naked branches, which are almost destitute of ramuli; others are more or less dichotomous, with many lateral, second branches, and tolerably furnished with similar ramuli. Usually the branches are very



erect ; but sometimes they are arched ; and, in a distorted variety occasionally found, they are bent at right angles in a zigzag manner. In all the lesser branches and ramuli taper considerably to each end. *Tubercles* (*coccidia*) large, sessile, roundish or subovate, with a subacute nipple, plentifully scattered over the branches, and containing a mass of minute, ovate *spores* ; their pericarp composed externally of radiating filaments, internally of angular cells. *Tetraspores* minute, imbedded in the surface cells of the branches, or distinct plants. *Colour* a pale or deep purple-red, becoming greenish, and at length white in decay. *Substance* cartilaginous, flexible, horny when dry, and very imperfectly adhering to paper.

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A variable plant, as its numerous synonymes testify, and yet, with a little practice, easily recognized among British Algæ. Several exotic species, however, nearly approach it, some of which ought, perhaps, to be united with it.

By Dr. J. Agardh, in his excellent work on the Algæ of the Mediterranean, *Gracilaria confervoides* is placed in the genus *Hypnea*. If the differences between the genera *Hypnea* and *Gracilaria* consist, as Agardh declares, more in peculiarities of natural habit than of definite structural characters, in my opinion, *C. confervoides* coincides better with the latter group ; and I am very unwilling to place it in a different genus from such nearly allied plants as *G. dura* and *G. compressa*. But besides natural habit, the tetraspores in the *true Hypneæ* are, I believe, always annularly divided, like those of *Plocamium*, and I am not aware of this being the case in any species of *Gracilaria*.

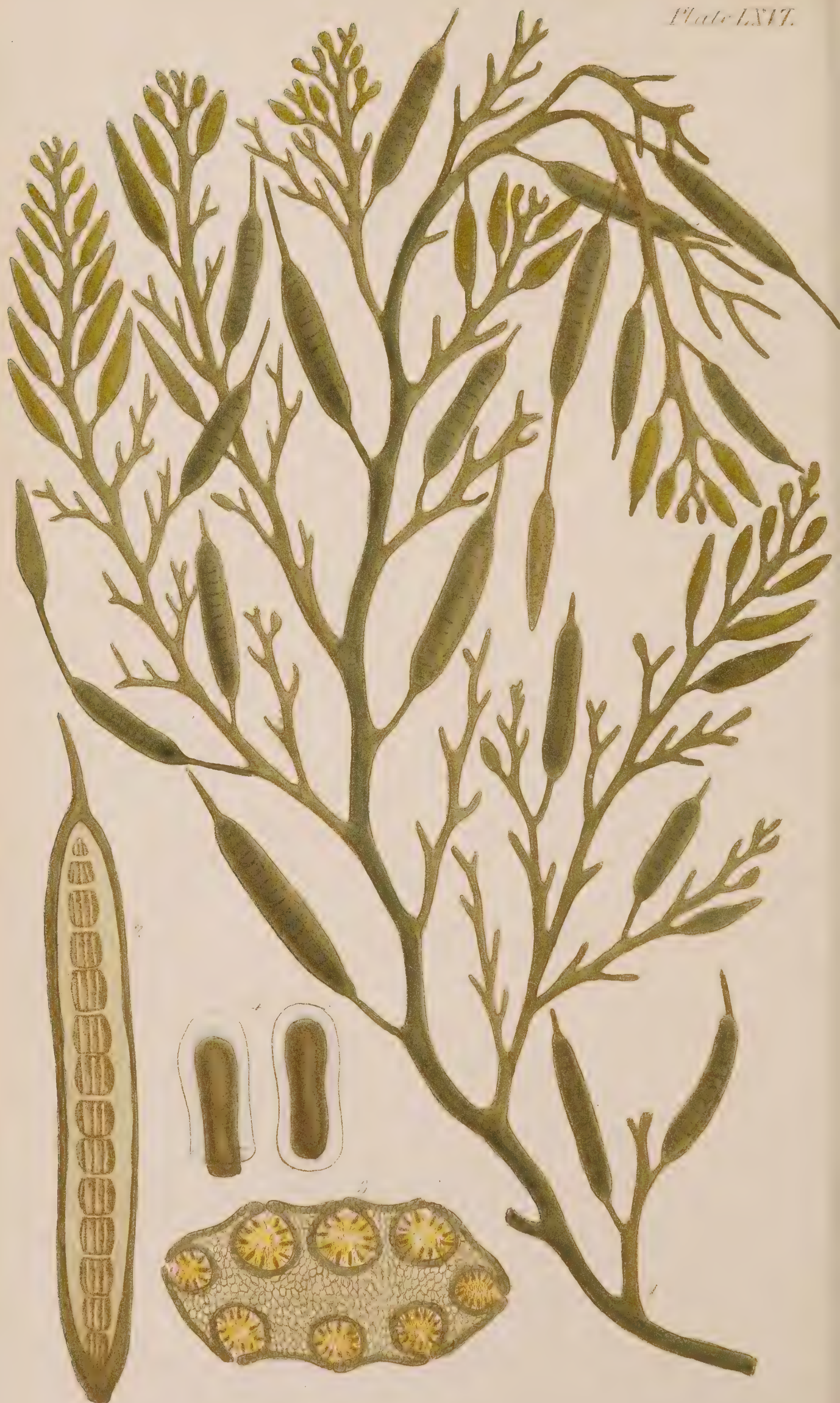
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Fig. 1. GRACILARIA CONFERVOIDES:—*natural size*. 2. Longitudinal semi-section of a branch. 3. Transverse section of the same. 4. Vertical section of a tubercle. 5. Spores from the same.

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## PLATE LXVI.

HALIDRYS SILIQUOSA, *Lyngb.*

GEN. CHAR. *Frond* compressed, linear, pinnated with distichous branches. *Air-vessels* lanceolate, stalked, divided into several cells by transverse partitions. *Receptacles* terminal, stalked, cellular, pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing parietal *spores* and tufted *antheridia*. HALIDRYS (*Lyngb.*) —from  $\alpha\lambda\varsigma$ , the *sea*, and  $\delta\rho\upsilon\varsigma$ , an *oak*.

HALIDRYS *siliquosa*; branches linear, very narrow; air-vessels compressed, linear-lanceolate, slightly constricted at the septa, mucronate.

HALIDRYS *siliquosa*, *Lyngb. Hyd. Dan.* p. 37. *Grev. Alg. Brit.* p. 9. t. 1. *Hook. Brit. Fl.* vol. ii. p. 266. *Wyatt, Alg. Danm.* no. 53. *Harv. in Mack. Fl. Hib.* part 3. p. 168. *Harv. Man.* p. 19. *Endl. 3rd Suppl.* p. 30.

CYSTOSEIRA *siliquosa*, *Ag. Sp. Alg.* vol. i. p. 72. *Ag. Syst.* p. 287. *Spreng. Syst. Veg.* vol. iv. p. 317. *Grev. Fl. Edin.* p. 285.

FUCUS *siliquosus*, *Linn. Sp. Pl.* p. 1829. *Syst. Nat.* vol. ii. p. 716. *Fl. Lapp.* p. 365. *Gm. Hist.* p. 81. t. 2. B. *Fl. Dan.* t. 106. *Huds. Fl. Ang.* p. 574. *Lightf. Fl. Scot.* vol. ii. p. 921. *With.* vol. iv. p. 88. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 124. *E. Bot.* t. 474. *Stack. Ner. Brit.* p. 8. t. 5. *Turn. Syn.* vol. i. p. 60. *Hist.* t. 159. *Esper, Ic. Fuc.* t. 8.

FUCUS *siliculosus*, *Stack. Ner. Brit.* t. 11.

HAB. On rocks and stones in the sea, at and below half tide level. Perennial. Winter and Spring. Common on the shores of the British Islands.

GEOGR. DIST. North Sea, and Northern Atlantic.

DISTR. *Root*, a large, conical disc. *Fronds*, from one to four feet long or more, linear, compressed, two-edged, from one to two lines in breadth, flexuous, mostly undivided, distichously pinnate or bi-pinnate. *Pinnæ* alternate, erectopate, issuing with an obtuse axil; the *lower* ones much lengthened, and either naked below, or furnished with a few small branchlets and air-vessels, pinnate, or bi-pinnate above, the smaller divisions set with alternate vesicles or with receptacles; the *upper* pinnæ gradually shorter, more simple, and better furnished than the lower, and generally terminating in racemes either of vesicles or of receptacles. *Air-vessels* linear, oblong, or lanceolate, supported on slender stalks, and tipped by a linear mucro of various length, from a quarter inch to an inch and a half, and which sometimes bears at its apex a receptacle. The air-vessels are externally marked with transverse, constricting lines, very visible when dry, which correspond to internal septa dividing the hollow inside into numerous distinct chambers, through which run several longitudinal threads. *Receptacles* either forming racemes at the apices of the branches, or terminating the mucrones of the vesicles, lanceolate, subacute, on short stalks, distichous, compressed, furnished with

numerous pores communicating with the immersed *conceptacles* or spore-chambers. These latter are spherical, and contain numerous oblong, simple, dark-brown spores, mixed with tufts of branching filaments bearing bright orange *antheridia*. *Colour*, when young, a greenish olive, in age becoming a rich brown. *Substance* very tough and leathery.

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One of the handsomest of the British *Fuceæ* and common on all our shores. It is subject to little variation, except in size. When growing in shallow water, or in tide pools near high water mark, it becomes stunted in its habit, having the branches more closely set, and bushy, and every part proportionably smaller and narrower. This state constitutes the var.  $\beta$ . of authors.

The genus *Halidrys*, founded by Lyngbye, is well distinguished from all other *Fuceæ* by the curious structure of its air-vessels. These compound air-vessels are confined to the present individual, and to the beautiful *Fucus osmundaceus* of Turner, a native of the West coast of North America. In this latter species the structure is slightly different, and the vesicles are much constricted at the joints, like strings of beads. The whole habit, however, is so very similar to that of our *H. siliquosa*, that I cannot but consider it as properly a member of the same natural genus.

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Fig. 1. HALIDRYS SILIQUOSA; Portion of a branch:—*the natural size*. 2. Longitudinal section of an air-vessel. 3. Transverse section of a *receptacle*, with its immersed *conceptacles*, containing spores and antheridia. 4. Spores:—*all more or less magnified*.

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## PLATE LXVII.

GRIFFITHSIA EUISETIFOLIA, *Ag*.

GEN. CHAR. *Frond* rose-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single tubed; dissepiments hyaline. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* affixed to whorled involucre; 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA,—so named by *Agardh*, in honour of Mrs. Griffiths, the most distinguished of British Algologists.

GRIFFITHSIA *equisetifolia*; stems robust, cartilaginous, whorled throughout with closely imbricated, incurved, many times dichotomous ramuli.

GRIFFITHSIA *equisetifolia*, *Ag. Syn.* p. 28. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 143. *Grev. Fl. Edin.* p. 312. *Ag. Sp. Alg.* vol. ii. p. 133. *Hook. Brit. Fl.* vol. ii. p. 337. *Wyatt, Alg. Danm.* no. 181. *J. Alg. Medit.* p. 78. *Harv. in Mack. Fl. Hib.* part 3. p. 211. *Endl. 3rd Suppl.* p. 35.

HALURUS *equisetifolius*, *Kütz. Phyc. Gen.* p. 374.

CONFERRA *equisetifolia*, *Lightf. Fl. Scot.* p. 984. *With.* vol. iv. p. 133. *Dillw. Conf.* t. 54. *E. Bot.* t. 1479. *Esper. Fuc. Sup.* t. 4.

CONFERRA *imbricata*, *Huds. Fl. Ang.* p. 603. *Roth. Cat.* vol. iii. p. 281.

CONFERRA *cancellata*, *Roth. Cat.* vol. ii. p. 230.

CERAMIUM *equisetifolium*, *D.C. Syn.* p. 8.

HAB. On marine rocks, at extreme low water mark. Perennial. Summer. Frequent on the southern and western shores of England, and Ireland. Wales, common, *Mr. Ralfs*. Rare in Scotland. Frith of Forth, *Mr. Yalden (Lightf.)*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea. Falkland Islands, *Agardh*.

DESCR. *Root*, an expanded callus, coated with shaggy fibres. *Stems*, mostly solitary, from three to nine inches in height, and from a quarter-line to nearly a line in diameter, much and irregularly branched, and clothed throughout with short ramuli, which on the older parts of the fronds are densely aggregated, forming an irregular shaggy pile, but on the younger parts they are regularly whorled, the apices of the lower whorls lying closely over the bases of those above them. Main branches long, either subsimple or once or twice irregularly forked, or repeatedly dichotomous, generally furnished with numerous short, spindle-shaped, simple branchlets, given off laterally, and at very uncertain distances, sometimes scattered along the branches, sometimes crowded round the apices. These are clothed throughout with whorled, dichotomous, incurved ramuli. Joints of the branches about twice as long as broad; of the ramuli, 3–4 times, swollen upwards. *Favellæ* borne on the tips of short branches, imperfectly involucre, two or three

lobed, with a wide limbus, and containing masses of dark-red, angular spores. *Tetraspores* contained in spherical, pedicellate involucre composed of a whorl of dichotomous ramuli, borne along the sides of the branches. Besides these normal kinds of fruit, what appears to be an abnormal effort at fructification (or possibly *antheridia*?), is sometimes found; consisting of oval bodies, composed of bundles of excessively fine dichotomous filaments, contained in involucre similar to those occupied by tetraspores, and attached in the same manner as tetraspores are (fig. 7, 8, 9.). *Colour* when fresh, a dark full red, becoming brownish in drying. *Substance* firm, and somewhat cartilaginous.



*Griffithsia equisetifolia* was first described by Lightfoot in the year 1777, in his 'Flora Scotica', on the authority of a specimen communicated by Mr. Yalden from the Frith of Forth, and it is not a little remarkable that though the plant has been found on most parts of the English and Irish coasts, since Lightfoot's time, yet no more recent instance of its occurrence in Scotland has been recorded, nor have I received it from any of my Scotch correspondents.

While in fructification it perfectly agrees with others of the genus; it differs considerably in habit from all, with the exception of *G. simplicifilum*, a plant which ought, perhaps, rather to be considered as a slender variety of the present, than as a distinct species.

The curious bodies which I have noticed in the description under the name of *antheridia*, and introduced into the plate, were communicated to me by Mrs. Griffiths, who discovered them last year, on some specimens collected many years ago at Torquay. They are of a very anomalous nature, which in the present state of our knowledge it is impossible to explain. Similar bodies are frequently produced by *G. setacea*, on which they were first noticed by Miss Biddulph; and are found on so many species of *Callithamnion*, that one is tempted to anticipate their being detected upon all. Should this prove to be the case, it will certainly favour the idea of their analogy with *antheridia*, and discredit the notion which I have hitherto entertained, namely, that they are a viviparous state of tetraspores.

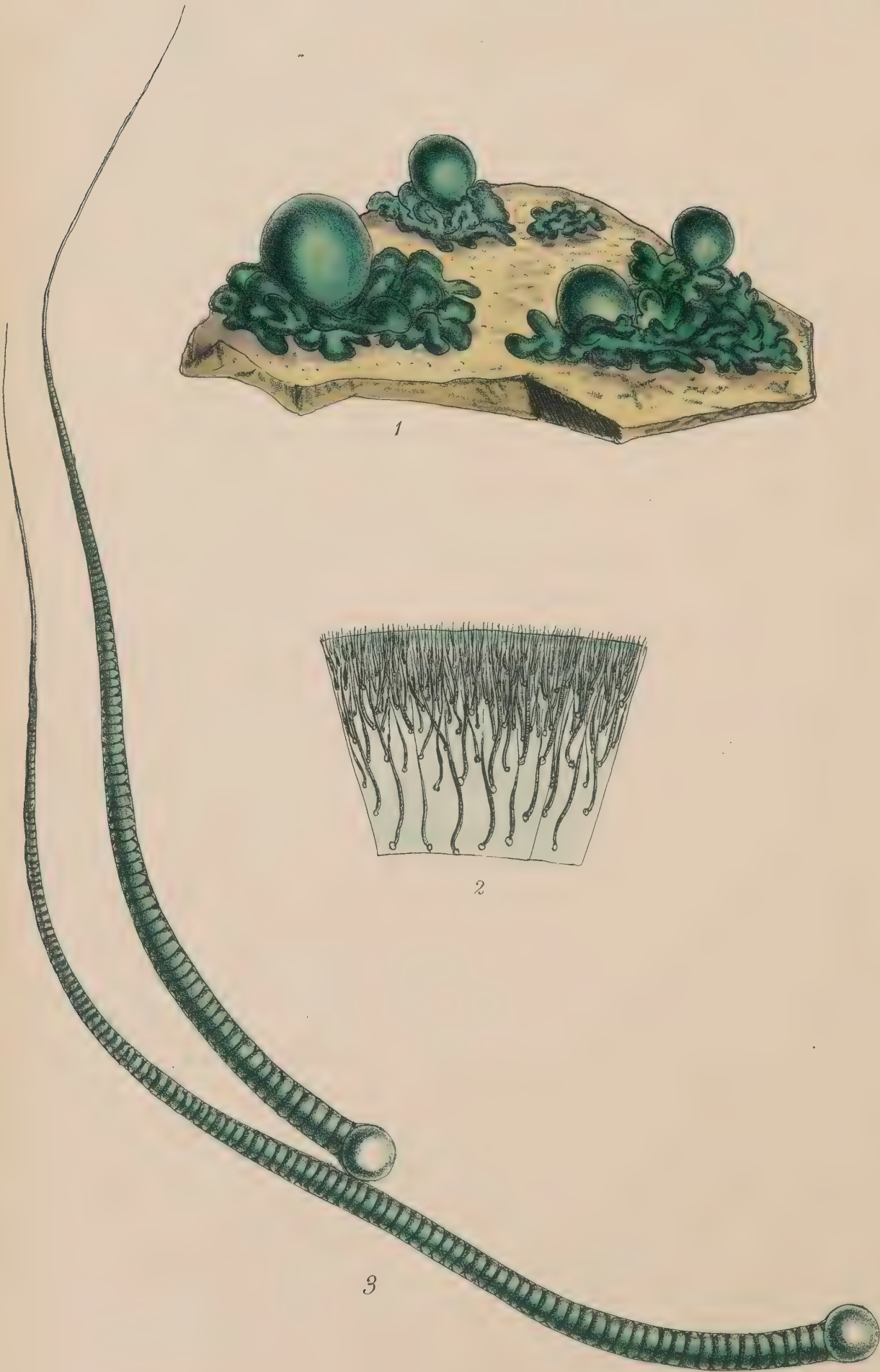
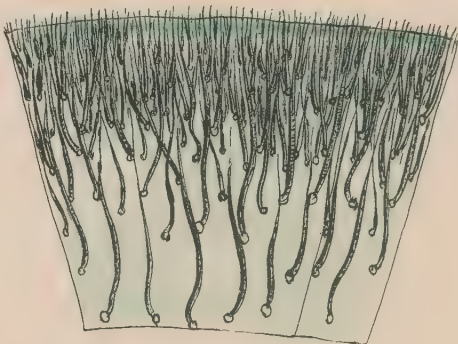
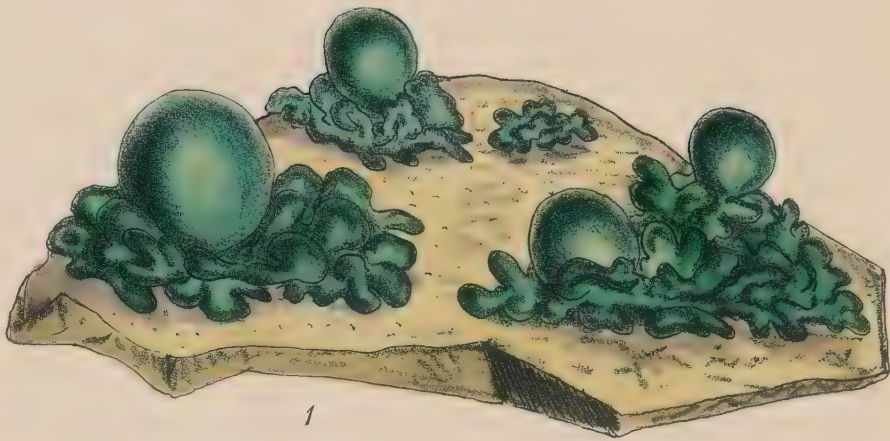
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Fig. 1. GRIFFITHSIA EUISETIFOLIA:—*the natural size*. 2. Portion of a branch, and two involucre. 3. A ramulus. 4. An involucre. 5. A tetraspore. 6. Apex of a branch, with a favella. 7. Involucre producing *antheridia*?. 8. An *antheridium*? 9. Fragment of the same:—*all more or less highly magnified*.

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## PLATE LXVIII.

RIVULARIA NITIDA, *Ag.*

GEN. CHAR. *Frond* globose or lobed, fleshy, firm, composed of continuous radiating filaments, annulated within, and springing from a spherical globule. RIVULARIA,—so named by Roth, in allusion to the fluviatile habitat of some of the first discovered species.

RIVULARIA *nitida*; frond (large), gelatinoso-coriaceous, lobed and plaited, often bullated, lubricous, shining deep green, filaments simple, very much attenuated.

RIVULARIA *nitida*, *Ag. Syst.* p. 25. *Harv. in Hook. Br. Fl.* vol. ii. p. 393. *Harv. in Mack. Fl. Hib.* part 3. p. 235. *Wyatt, Alg. Danm.* no. 50. *Harv. Man.* p. 152. *Endl. 3rd Suppl.* p. 12.

RIVULARIA *bullata*, *Berk. Gl. Alg.* t. ii. f. 1. *J. Ag. Alg. Medit.* p. 9. *Endl. 3rd Suppl.* p. 13.

SCYTOCHLORIA *nitida*, *Harv. in Hook. Br. Fl. l. c.*

ALCYONIDIUM *bullatum*, *Lamour.*

PHYSACTIS *lobata*, *Kütz. Phyc. Gen.* p. 236. t. 4. f. 5.

HAB. On marine rocks, at half-tide level. Annual. Summer and Autumn. Common on the southern shores of England, and south and west of Ireland.

GEOGR. DISTR. Baltic Sea. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Fronds*, from  $\frac{1}{2}$  an inch to an inch or more in diameter, tremelloid, tufted or gregarious, much lobed and sinuated, at first compressed, and filled with solid gelatine; afterwards hollow and inflated. *Substance* very firm and elastic, not easily torn, lubricous and subgelatinous to the touch. *Colour* a deep, but very vivid green. *Filaments* simple or pseudo-branched, wavy, laxly set in the interior of the frond, densely packed towards the surface, tapering to a very long, setaceous point, densely annulated within. *Striæ* very conspicuous.

This is the largest marine species of *Rivularia* on the British shores, ornamenting, at the end of the summer, perfectly barren masses of rock with its bright-green glossy patches. On the western shores of Ireland it is very common as far north as Galway, and perhaps further; but has only, that I am aware of, been observed on the southern shores of England. Yet it inhabits the Baltic Sea. It probably, therefore, exists in many places on our shores, where it has been overlooked.

The genus *Rivularia*, as originally proposed by Roth, con-



tained a very heterogeneous assemblage of plants, including almost every Alga which is outwardly gelatinous, and whose inward structure exhibits a filamentous arrangement. Thus such plants as *Gloiosiphonia* were included in it, as well as the *Chætophoræ*, and many others equally unlike each other. The group to which the name is now restricted, is distinguished by having a gelatinous frond of a definite form, filled with radiating threads, each of which terminates at its lower extremity in a globular cellule. The plants thus associated have a strong affinity together, but are not exclusively marine, several of them inhabiting fresh water, and others growing on moist rocks. Some of the latter have the property of secreting lime in their tissues, if not in such a regular manner as the Corallines, in a manner approaching to it. None of the marine species exhibit this property.

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Fig. 1. Patches of RIVULARIA NITIDA:—*the natural size*. 2. Portion of the gelatinous frond. 3. Filaments:—*magnified*.

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## PLATE LXIX.

GINNANIA FURCELLATA, *Mont.*

GEN. CHAR. *Fronde* terete, dichotomous, membranaceo-gelatinous, traversed by a fibrous axis from which slender dichotomous horizontal filaments radiate towards the membranous periphery; surface cellules hexagonal. *Fructification*, spherical masses immersed in the frond, affixed to the inner coating of the periphery, composed of radiating filaments, whose apical joints are finally converted into spores. GINNANIA (*Mont.*), in honour of *Count G. Ginnani*, of Ravenna, author of a work on the productions of the Adriatic sea, published 1755.

GINNANIA *furcellata*; frond cylindrical, tender, uniformly dichotomous; the segments obtuse.

GINNANIA *furcellata*, *Mont. Pl. Cell. Can.* p. 162. *Endl. 3rd Suppl.* p. 40.

HALYMENIA *furcellata*, *Ag. Sp. Alg.* vol. i. p. 212. *Ag. Syst.* p. 244. *Grev. Alg. Brit.* p. 163. *Hook. Br. Fl.* vol. ii. p. 308. *Harv. in Mack. Fl. Hib.* part 3. p. 189. *Wyatt, Alg. Danm.* no. 79. *J. Ag. Alg. Medit.* p. 98. *Hook. fil. et Harv. in Lond. Journ. Bot.* vol. iv. p. 548.

MYELOMIUM *furcellatum*, *Kütz. Phyc. Gen.* p. 393. t. 73. f. 1.

ULVA *furcellata*, *Turn. in Scr. Journ.* 1800-2. p. 301. *E. Bot.* t. 1881.

ULVA *interrupta*, *Poir. Encycl.* vol. viii. p. 171. *D.C. Fl. Fran.* vol. vi. p. 3.

DUMONTIA *triquetra*, *Lamour. Ess.* p. 45.

CORALLOPSIS *dichotoma*, *Suhr. Bot. Zet* (1839). p. 70. f. 44.

Var.  $\beta$ , *subcostata*, broader than usual, with a stronger nerve, and here and there constricted.

HALYMENIA *furcellata*,  $\beta$ . *subcostata*, *J. Ag. Alg. Medit.* p. 98.

HAB. On rocks, stones, oyster shells, &c., from low water mark to eight or ten fathoms water. Annual. Summer. Rather rare. Eastern and southern shores of England, frequent. Bantry Bay, *Miss Hutchins.* Malbay, *W. H. H.* Glenarm, *Miss Davison.* Howth, *Miss Gower.* Roundstone Bay, *Mr. Mc' Calla.* Strangford Lough, *Mr. Thompson.* Belfast Bay, *Mr. G. Hyndman.* Not found in Scotland?

GEOGR. DISTR. Atlantic shores of Europe. Baltic and Mediterranean Seas. Cape of Good Hope. New Zealand. Chili. Sandwich Islands.

DESCR. *Root*, a small scutate disc. *Fronde*s subsolitary, or several growing together, from two to eight or ten inches in length, and from a line to nearly half an inch in diameter, cylindrical or subcompressed, tapering to the base, repeatedly and regularly dichotomous, the furcations of equal length, and the tufts perfectly fastigate. *Apices* generally obtuse and rounded, occasionally lengthened out to a bluntish or subacute point. Sometimes the frond is constricted in several places as if jointed, and occasionally when the branches become accidentally truncated, young frondlets

are produced prolifically from the wounded part. The whole frond is traversed through its centre by an axis composed of innumerable, slender, intertwined filaments, which is sometimes very visible through the outer skin, at other times obscure, but may always be found by carefully making a transverse section of any part. From this axis there issue horizontally radiating dichotomous jointed filaments, which connect it with the wall or periphery of the frond. The interval between the filaments is filled with a watery gelatine. The *fructification* is abundantly scattered throughout the whole frond, and may invariably, I believe, be found on all specimens. It consists in spherical masses attached beneath the membranous periphery, and made up of densely packed filaments radiating from a central point. At maturity the outer portions of these develop spores. The colour varies from a brownish red to a clear transparent pink, and the substance from firmly membranaceous, to very tender and gelatinous. It shrinks very much in drying, and never perfectly recovers its form on re-immersion.

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The earliest description of this species was by Mr. Dawson Turner, in the year 1800, whose specimens were collected at Sheringham in Norfolk. Since that time it has been found on many parts of the shores of Europe, and also brought from very distant places in both hemispheres, and in the Pacific, as well as Atlantic Oceans. Those which I possess from the Southern Ocean, are in all respects identical with British specimens.

But though this plant is so widely distributed, and ought to be so well known, a very remarkable feature of its structure has been passed over by most authors who have described it, and only recently mentioned by Professor J. Agardh, as characteristic of his var.  $\beta$ . I allude to the *axis* or internal *costa*, which exists in all specimens which have come under my notice, though it is very much more apparent in some than in others. Owing to the imperfect manner in which the frond recovers its form on immersion, after having been dried, this *costa* cannot always be shown by a transverse cutting of a dried specimen; but in the recent plant it may at once be detected, even where most obscure. In the var.  $\beta$ . it is remarkably strong, and appears in a flattened dried specimen like the mid-rib of a *Delesseria*. This I have already noticed in the 'Manual', as existing in specimens found by Miss Hutchins at Bantry.

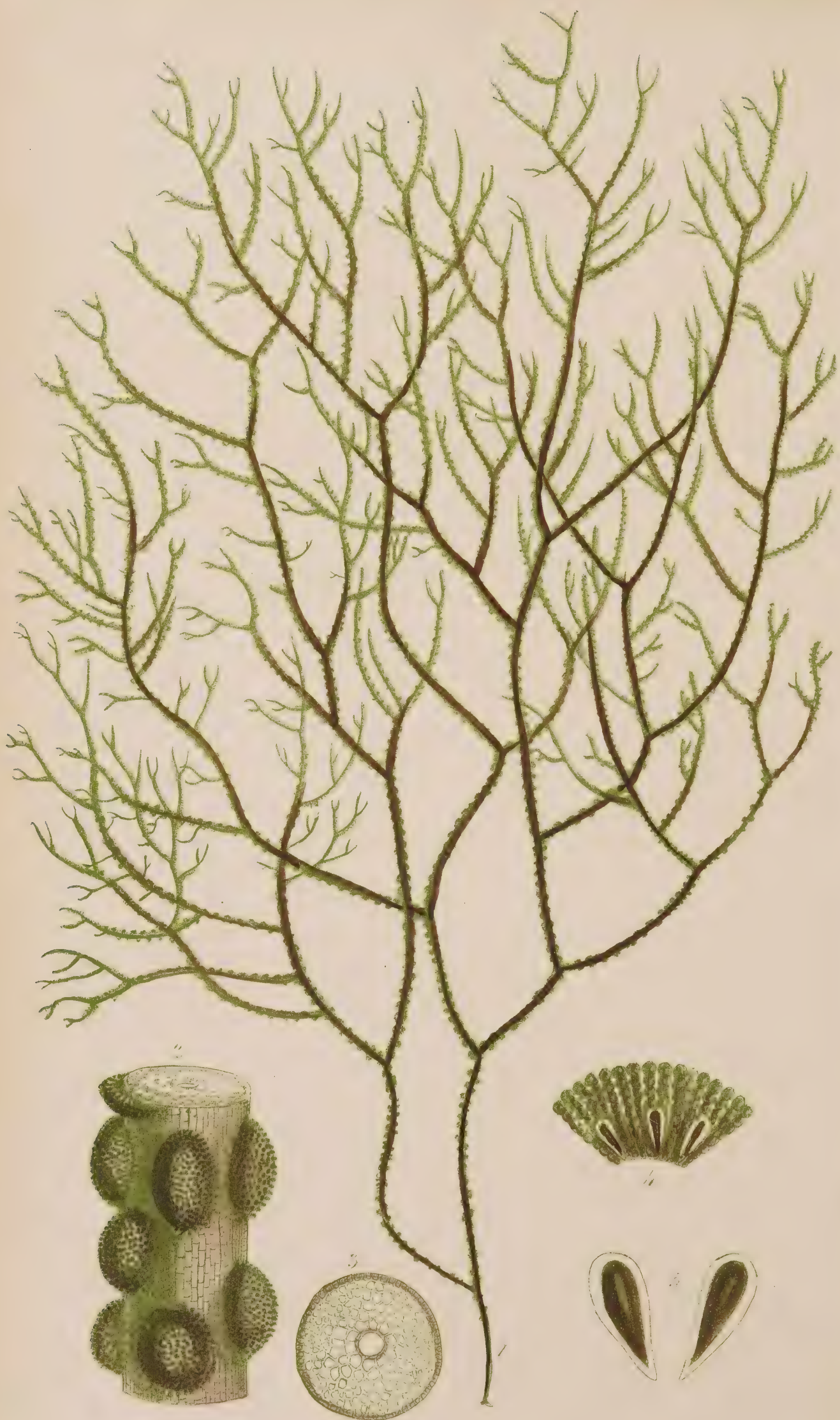
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Fig. 1. GINNANIA FURCELLATA:—*the natural size*. 2. Apex of a branch:—*slightly magnified*. 3. Transverse section. 4. Longitudinal semi-section of a branch. 5. Vertical view of the membrane of the frond. 6. Portion of one of the radiating filaments and of the cellules of the periphery. 7. Globule of fructification:—*all more or less highly magnified*.

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## PLATE LXX.

STILOPHORA RHIZODES, *J. Ag.*

GEN. CHAR. *Root* a small, naked disc. *Frond* filiform, solid or tubular, branched. *Fructification*, convex, wart-like sori scattered over the surface, composed of obovate spores nestling among moniliform, vertical filaments. STILOPHORA (*J. Ag.*),—from *στιλη*, a *point* or *dot*, and *φορέω*, to *bear*; in allusion to the dot-like fructification.

STILOPHORA *rhizodes*; frond subsolid, much and irregularly branched, the branches subdichotomous, attenuated; ramuli scattered, forked; fructification densely covering the whole plant.

STILOPHORA *rhizodes*, *J. Ag. Linn.* vol. xv. p. 6. *Endl. 3rd Suppl.* p. 26.

SERMATOCNUS *rhizodes*, *Kütz. Phyc. Gen.* p. 335.

SPOROCHNUS *rhizodes*, *Ag. Sp. Alg.* vol. i. p. 156. *Ag. Syst.* p. 260. *Spr. Syst. Veg.* vol. iv. 329. *Grev. Alg. Brit.* p. 43. t. 6. *Hook. Br. Fl.* vol. ii. p. 275. *Harv. in Mack. Fl. Hib.* part 3. p. 173. *Wyatt, Alg. Danm.* no. 5. *Harv. Man.* p. 27 (excl. var.  $\beta$ .).

CHORDARIA *rhizodes*, *Ag. Syn.* p. 15. *Lyngb. Hyd. Dan.* p. 52. t. 13.

FUCUS *rhizodes*, *Turn. Hist.* t. 235.

CONFERVA *rhizodes*, *Ehr. in Herb.*

CONFERVA *gracilis*, *Wulf. Crypt. Aquat.* no. 23.

CONFERVA *verrucosa*, *E. Bot.* t. 1688.

CERAMIVM *tuberculosum*, *Roth, Cat. Bot.* vol. ii. p. 162. vol. 112.

HAB. Near low water mark, growing either on rocks, or parasitically on other Algæ. Annual. Summer. Southern shores of England, frequent. Common on the eastern, southern, and western shores of Ireland. Belfast Bay, and Strangford Lough, *Mr. W. Thompson*. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea.

DESCR. *Root*, minute, scutate. *Fronds* solitary, or tufted, from six inches to two feet, or more, in length, cylindrical, filiform, much and irregularly branched, sometimes pretty regularly dichotomous, sometimes with a leading stem bent in a flexuous or zigzag manner, and furnished with closely set, alternate branches, which are more or less regularly dichotomous. In some specimens several of the branches are secund, and plentifully beset with short, simple, or forked ramuli; in others the branches are bare and but little divided. In all varieties the axils are obtuse, and the apices taper to a more or less fine point. The fructification is very densely dispersed over the whole frond, giving the branches a warted or knotted aspect. The warts are either hemispherical or oval, and consist of radiating, beaded, clavate, simple filaments, among which obovate spores, with wide borders, and narrow, tapering bases are found fixed to the surface of the frond. In a young state the frond is quite solid, composed of roundish or subhexagonal cells, the outermost of which



are gradually smaller; in age the centre becomes more or less hollow. *Substance* when fresh, cartilaginous, but if kept long, becoming very gelatinous and slippery, giving out in fresh water, considerable quantities of slimy matter. *Colour* yellowish brown, either drying to an olive, or retaining much of its original hue.

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Hitherto, in British works, the plant here figured has been regarded as a species of *Sporochnus*. It is now removed, according to the views of all recent continental authorities, to the *Dictyotæ*, in which family it constitutes the type of a new genus. If we compare its fructification with that of *Asperococcus*, or of *Punctaria*, we shall be satisfied that its true place in the system cannot be very far apart from these genera. The difference, indeed, is more in the nature of the frond, and the general habit, than in the fructification. From the true *Sporochni*, one of which we have figured at Pl. LVI. the fructification of the present plant essentially differs, the position of the spores, their form, and the nature of the filaments that accompany them, being quite dissimilar.

The var.  $\beta$ . of British authors is now regarded by Professor J. Agardh as a distinct species, called by him *Stilophora Lyngbyei*. I have some hesitation in admitting it to the rank of a species notwithstanding its peculiar character, and the great abundance and uniformity of its production, wherever it occurs; and it has been found from the south of Ireland to the Orkneys, everywhere preserving the fistular stem, divaricated branches, and attenuated ramuli. It is always found in deeper water than the normal form, and always in land-locked bays, and these modifying causes I have hitherto believed, produce the variations. It is, however, at least a well-marked variety, and, as such, deserving of a figure and description, both which I purpose affording it in a future number of this work.

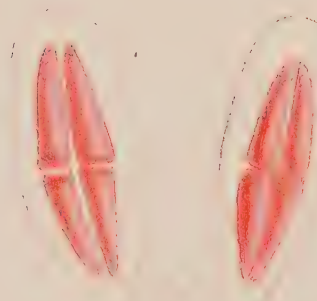
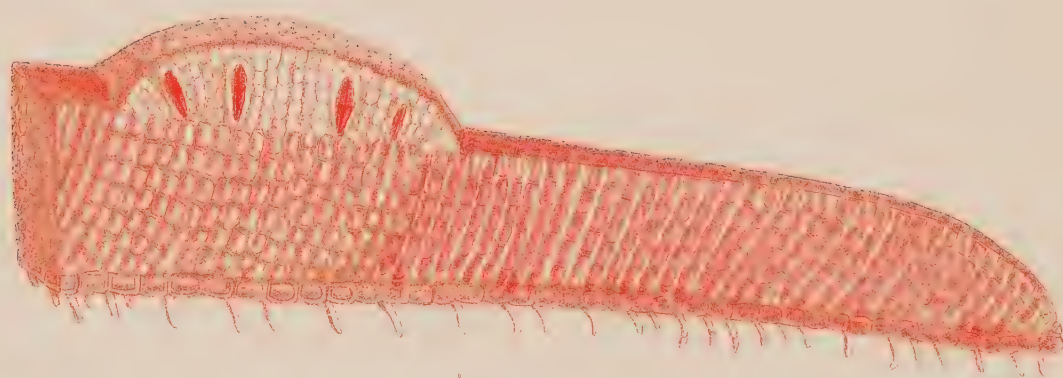
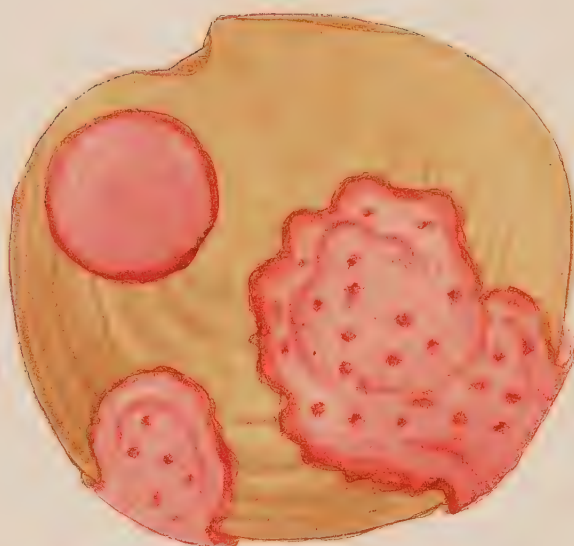
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Fig. 1. *STILOPHORA RHIZODES*:—*the natural size*. 2. Part of a branch. 3. Transverse section of the same. 4. Section of a sorus. 5. Spores:—*all more or less highly magnified*.

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## PLATE LXXI.

PEYSSONELIA DUBYI, *Crouan*.

GEN. CHAR. *Fronde*, brownish red, depressed, rooting by the under surface, concentrically zoned, composed of several rows of cellules, disposed obliquely in filamentous series. *Fructification*; warts scattered over the upper surface of the frond, formed of radiating filaments, and containing oblong, cruciately divided tetraspores. PEYSSONELIA (*Dne.*) —in honour of *J. A. Peyssonel*, an early and meritorious observer of marine plants, especially of Corallines.

PEYSSONELIA *Dubyi*; frond membranaceous, orbicular or lobed, attached by the whole of its under surface.

PEYSSONELIA *Dubyi*, *Crouan*, in *An. Sc. Nat.* 1844. p. 368. t. 11. B.

HAB. On old shells, stones, &c., in 10–15 fathoms water. Probably common on the British coasts. North of Ireland, *Mr. Thompson*. Birturbui Bay, on the Scallop bank, *Mr. Mc' Calla*. West of Scotland, *Rev. D. Landsborough*.

GEOGR. DISTR. Coast of Normandy, *Crouan*, (probably on all the Atlantic shores of Europe?).

DESCR. *Fronde*, from half an inch to an inch and a half in diameter, at first orbicular, in age becoming irregularly shaped, with a lobed or wavy margin, the lobes here and there overlapping each other, membranaceous, thin, concentrically zoned, attached by the whole of its under surface, by means of short, slender, colourless, rooting processes, which form a laxly disposed pubescence, extending over the lower surface. A vertical section of the frond exhibits a cellular structure, the cells arranged in ascending filamentous series, of which those near the centre of the frond are nearly vertical, and become more oblique as they approach the margin. *Fructification*, spongy warts, scattered over the upper surface, composed of pale filaments, similar except in colour, to those that compose the frond, among which are disposed vertical, elliptic-oblong tetraspores, the endochrome of which divides at maturity, by lines crossing at right angles, into four equal parts. *Colour*, a dull brownish red. *Substance* membranaceous.

The species here figured is an instance among many that might be mentioned, of one of those obscure plants which escape the attention of collectors, but which, when once pointed out, are found to be very common, and even to have been noticed and neglected by many persons, long previously to their having been found by the individual who has rescued them from oblivion by giving them a name. To whom in such cases attaches the



merit of discovery? Certainly to the last observer. In the present instance the palm belongs to M. Crouan, unless the *P. orbicularis* of Kützing, described a short time previously, be a synonyme.

My first acquaintance with this plant was at Roundstone, last summer, where, while dredging in Birturbui Bay, Mr. Mc'Calla called my attention to specimens which came up abundantly in the dredge, attached to broken shells, stones, &c., and informed me that he had frequently observed the plant before. On examination with the microscope, I at once recognized them as belonging to *Peyssonelia*, and not being then aware of M. Crouan's memoir, I believed that I had alit upon an undescribed species, which I proposed to call *P. borealis*. On communicating the supposed discovery to Mr. Thompson, he sent me a specimen dredged in Strangford Lough so long ago as 1833, and which had lain in his cabinet unnamed. And still more recently, on communicating with Mr. Berkeley, that learned Cryptogamist referred me to M. Crouan's memoir, and favoured me with an authentic specimen of the French plant, which proves to be perfectly similar to our Irish specimens.

The genus *Peyssonelia* was founded by Decaisne, on the *Fucus squammarius*, Gm., a species common in the Mediterranean, of larger size, and more coriaceous texture than the present, and attached by a portion only of its lower surface. The *Zonaria rubra*, Grev., in Linn. Trans. is probably the young of that species. I am only acquainted with Kützing's *P. orbicularis* by the short description given in his work, by which it appears to be very closely allied to our *P. Dubyi*, but to differ in having its lower surface glabrous, and closely adherent.

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Fig. 1. PEYSSONELIA Dubyi, growing on a dead shell of *Cytherea lincta*:—the natural size. 2. A vertical section of the frond, and of a wart. 3. Spores:—both magnified.

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## PLATE LXXII.

ASPEROCOCCUS COMPRESSUS, *Griff.*

GEN. CHAR. *Frond*, unbranched, tubular, cylindrical, or rarely compressed, continuous, membranaceous. *Root* naked, scutate. *Fructification* scattered over the whole frond, in minute distinct *dots* (*sori*), composed of roundish, prominent spores, mixed with club-shaped filaments. ASPEROCOCCUS,—corruptly formed from *asper*, *rough*, and *kokkos*, a *seed*.

ASPEROCOCCUS *compressus*; frond compressed, flat, linear-lanceolate, obtuse; dots of fructification oblong.

ASPEROCOCCUS *compressus*, *Griff. MSS. Hook. Br. Fl.* vol. ii. p. 278. *Wyatt, Alg. Danm.* no. 8. *Harv. Man.* p. 34. *J. Ag. Alg. Medit.* p. 41. *Menegh. Alg. Ital.* p. 164. t. 4. f. 1. *Endl. 3rd Suppl.* p. 26.

HALOGLOSSUM *Griffithsianum*, *Kütz. Phyc. Gen.* p. 340.

HAB. Parasitical on Algæ, beyond low water mark; usually cast on shore. Annual. Summer. Sidmouth and Torquay, *Mrs. Griffiths*. Mounts Bay, *Mr. Ralfs*. Falmouth, *Miss Warren*. Jersey, *Miss Turner*.

GEOGR. DISTR. Southern shores of England. Mediterranean Sea. Cherbourg. Cape Finisterre. Cape of Good Hope, *W. H. H.*

DESCR. *Root*, a small disc. *Frond*, from six to eighteen inches in length, and from a quarter of an inch to an inch and a half in breadth, attenuated at the base into a setaceous stem from a quarter to half an inch long, thence nearly linear upwards for the greater portion of its length, and again fining off towards the blunt point. Some specimens are nearly lanceolate, and much narrowed at the extremity; others are more nearly linear, and very blunt. The frond, though very much compressed, so as to be quite flat, is in reality tubular, but the sides of the tube are closely applied together, and here and there united by slender, colourless, jointed filaments. The surface cellules of the frond are minute; but those coating the inner face of the tube are very large, distended, and hyaline. *Fructification* is always abundantly produced. The *sori* are oblong, very densely scattered, and of larger size than in *A. Turneri*. The *Colour* varies from a pale yellowish to a full olive-green, occasionally brownish in age. The *substance* is tender, somewhat gelatinous, and the plant in drying, adheres perfectly to paper.

An interesting plant, curiously connecting the genus *Asperococcus* and *Punctaria*, having a frond nearly intermediate in character between that of these genera, but possessing rather more of the structure of the former. It was discovered by Mrs. Griffiths in the year 1828, at Sidmouth, and should it ever be

made the type of a new genus, as proposed by Kützing, his specific name, *Griffithsianum*, may very deservedly be adopted. At present I prefer leaving it in *Asperococcus*, from its very close affinity both with *A. echinatus* and *A. Turneri*.

It appears to be of not unfrequent occurrence in the Mediterranean, several stations being recorded. I possess a fine specimen from Catania, given me by M. Gussone; and I have gathered very large specimens at the Cape of Good Hope, much larger than any others that I have seen. It is very rare along the Atlantic coasts of France and Spain, as I am informed by M. Lenormand, who has kindly sent me a specimen gathered at Cherbourg; and may probably occur in North Africa, but I have not received any specimens from that coast. In the British Seas it has as yet, only been found along the southern shores of England, and in the Channel Islands; but it is not improbable that it may yet be discovered on the Irish coast, where so many southern forms reach their northern limit.

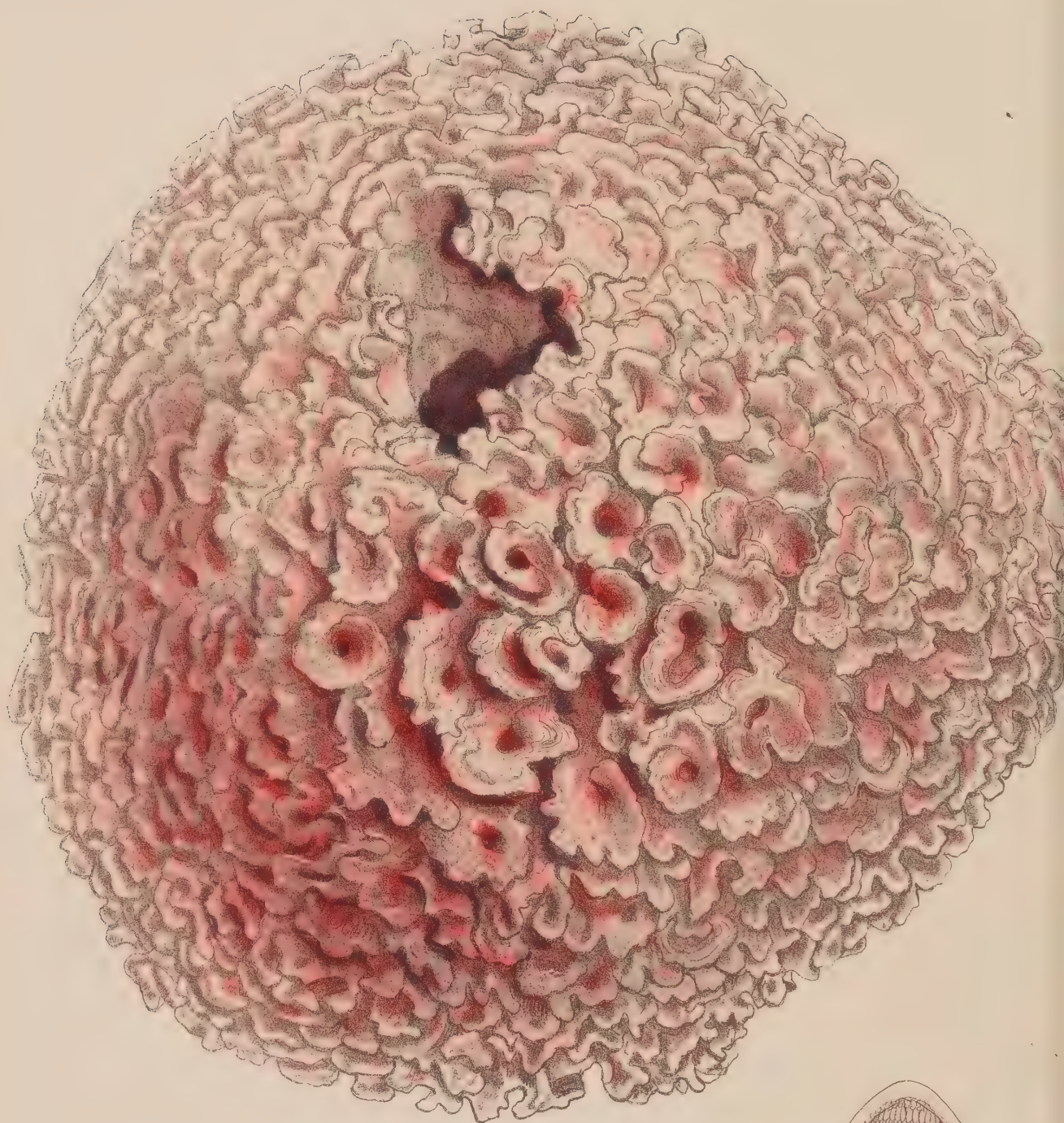
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Fig. 1. ASPEROCOCCUS COMPRESSUS:—*the natural size*. 2. A transverse section of the frond. 3. Portion of the same: more highly magnified 4. Portion of the membrane, viewed vertically. 5. Vertical section of a sorus:—*more or less highly magnified*.

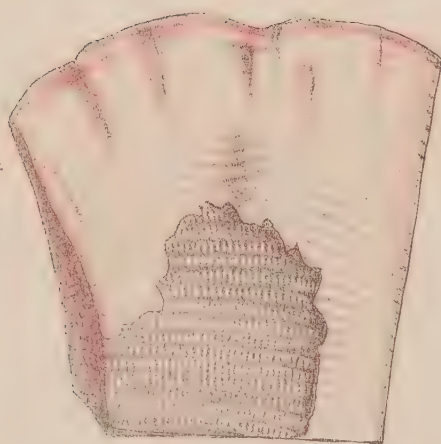
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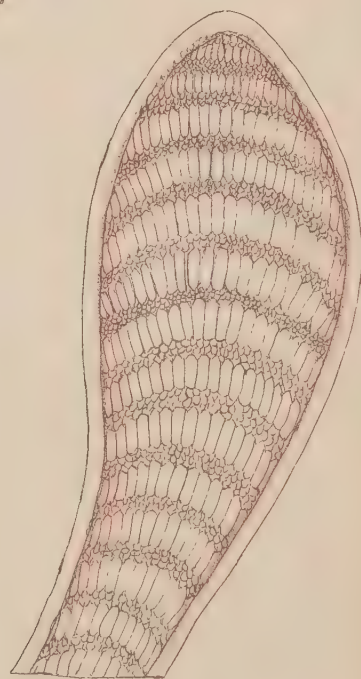




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## PLATE LXXIII.

MELOBESIA AGARICIFORMIS, *Harv.*

GEN. CHAR. *Frond*, attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched, (never articulated), coated with a calcareous deposit. *Fructification*; conical, sessile *capsules* (*ceramidia*), scattered over the surface of the frond, and containing a tuft of transversely parted, oblong *tetraspores*. MELOBESIA (*Lamour.*),—from one of the Sea nymphs of Hesiod.

MELOBESIA *agariciformis*; frond unattached, globular, hollow; foliations delicate, papyro-crustaceous, dense, erect, much lobed and sinuate, fastigate; margin thin, entire.

MILLEPORA *agariciformis*, *Pall. Elench.* p. 263. *Lam. An. s. vert.* vol. ii. p. 204. *2nd. Edit.* p. 2. 312.

MILLEPORA *coriacea*, *Linn. Syst.* p. 1285. *Esp. Mill.* t. 12.

MILLEPORA *decussata*? *Ellis et Soland. Zooph.* p. 131. t. 23. f. 9.

MILLEPORA *tortuosa*, *Esper.* t. 22.

NULLIPORA *agariciformis*, *Blainv. Actin.* p. 605. *Johnst. Br. Spon. and Lith.* p. 241. *woodcut*, no. 23.

POLLICIPORA *agariciformis*, *Ehr. Beitr.* p. 129.

LITHOPHYLLUM *expansum*, *Phil. in Wieg. Arch.* 1837. p. 389. *excl. syn.*

MELOBESIA *expansa*, *Endl. 3rd Suppl.* p. 49.

LITHOPHYLLUM *decussatum*? *Phil. l. c.* t. 9. f. 4.

MELOBESIA *decussata*? *Endl. l. c.*

MOSCO *petroso*, *Imperat. Hist. Nat.* 600. *cum. icone.*

FAVAGINE di Aristotele, *specie prima*, *Ginnani. Op.* t. 44.

HAB. Lying on the sandy bottom of quiet bays, in 2–3 fathoms water. Rare. Roundstone Bay, Cunnemara, in one or two places only, abundant but very local, *Mr. Mc' Calla*.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Frond*, unattached, forming globular or ovoid masses from four to eight inches in diameter, hollow within, seemingly from the decay of the central portion; very light, of a papery thinness and crustaceous substance; composed of innumerable sinuated and lobed laminæ, issuing from a point towards the centre of the frond, and directed in a radiating manner to the circumference. In the centre of the frond the laminæ are much united together, with vacant spaces and passages forming an irregular set of chambers; toward the circumference, the lobes are distinct from each other, standing erect, variously grouped; either sinuated, or bent into semicircular forms, imbricating on each other, or curled round into little cups, or trumpet mouthed siphons. The apices of all are nearly fastigate, and the margin is thin and quite entire. The *colour* when recent, is more or less tinged with

rosy-pink; when dry it fades to a yellowish; and when exposed to the sun becomes perfectly white, and rapidly crumbles to powder. Under the microscope, a longitudinal section (when the calcareous matter has been removed by acid) shows a series of concentrical zones, formed of oblong cells separated by narrow spaces, filled with granular cellules, or possibly the appearance of bands may arise from the remains of calcareous matter. Fig. 3. represents a section of this description.

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I follow Decaisne in referring the *Nulliporæ* of Lamarck to the *Melobesiæ* of Lamouroux, the latter name having been generally adopted by such botanists as have described these productions, and the former by such zoologists as lay claim to them. Both names originated in 1816, and whichever have priority, it must be a narrow question of months, which I am unable to decide. The species here figured would belong to *Spongites* of Kützing, and to *Lithophyllum* of Philippi; but does not appear in the list of *Melobesiæ* given by Decaisne, nor yet, except under the more modern trivial name, *decussata*, in that of Endlicher. Nevertheless it is one of the earliest known species, as its numerous synonymes testify.

The question of the vegetable nature of *Corallines*, among which the *Melobesiæ* take rank, may now be considered as finally set at rest, by the researches of Kützing, Philippi, and Decaisne, whose various memoirs, particularly that of the last named, have thrown much light on this obscure department of natural history, and fully confirmed the early views taken by Peyssonel, the elder Jussieu, Pallas, &c., in opposition to those of Ellis and most succeeding authors, who have associated them with the zoophytes. Outwardly, indeed, there is a striking resemblance, not less in form than in substance, between the Corallines and Corals; but it is merely an outward resemblance. Whoever macerates a portion of one of these stony vegetables in weak acid, till the lime it contains be dissolved, will find that he has a structure of a totally different nature from that of any zoophyte, while it is perfectly analogous to that of many Algæ. There is a near affinity, indeed, between the *Corallinæ* and the *Rhodomeleæ*; or perhaps still more, the *Condrieæ*.

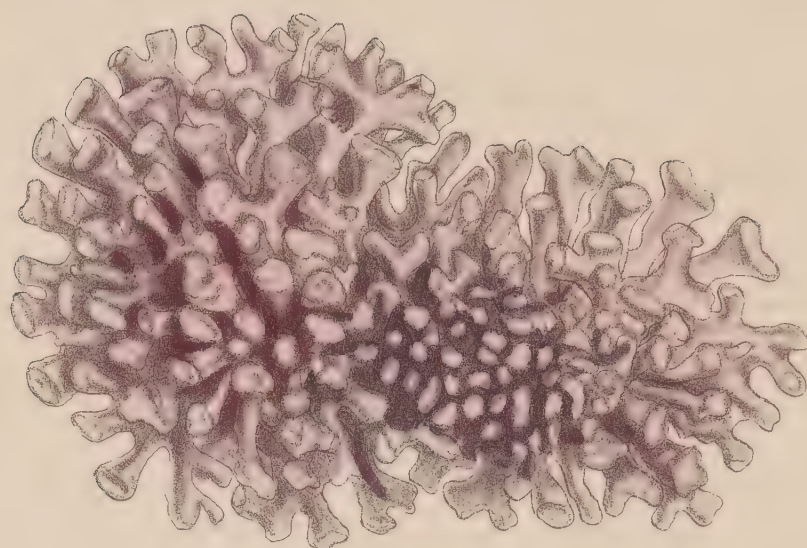
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Fig. 1. MELOBESIA AGARICIFORMIS:—*the natural size*. 2. Portion of a lamina, with some of its epidermis removed, showing the banded arrangement of the cellules:—*slightly magnified*. 3. Longitudinal section of the same:—*highly magnified*.

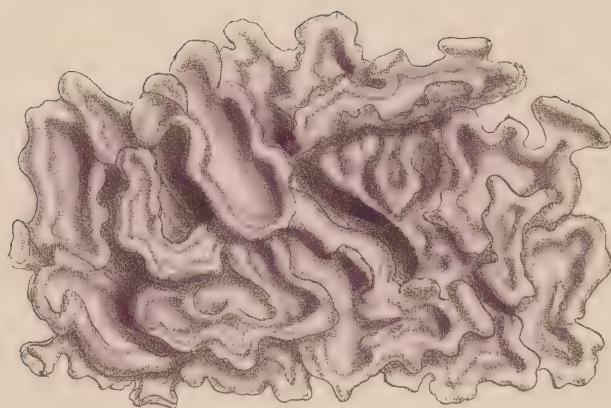
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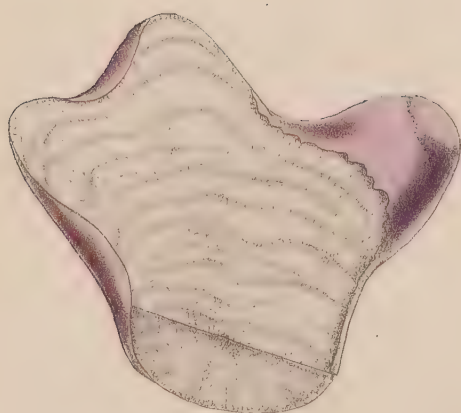




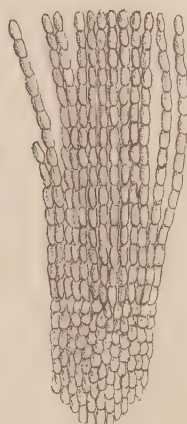
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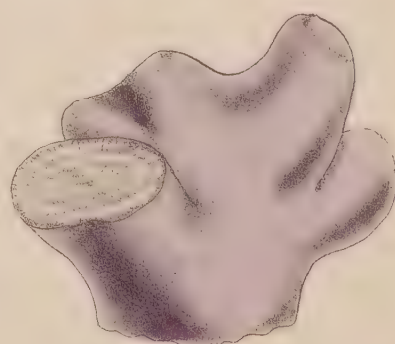
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## PLATE LXXIV.

MELOBESIA FASCICULATA, *Harv.*

GEN. CHAR. *Fronde* attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. *Fructification*; conical, sessile *capsules* (*ceramidia*) scattered over the surface of the frond, and containing a tuft of transversely parted, oblong tetraspores. MELOBESIA (*Lamour.*)—from one of the Sea nymphs of Hesiod.

MELOBESIA *fasciculata*; frond unattached, roundish or lobed, stoney, much branched, fastigiate; branches solid, thick, crowded together, cylindrical or compressed; apices truncate, broad, somewhat concave.

MILLEPORA *fasciculata*, *Lam. An. s. vert.* vol. ii. p. 203. 2nd. Edit. p. 211.

NULLIPORA *fasciculata*, *Blainv. Actin.* p. 605. *Johnst. Br. Spon. and Lith.* p. 240. t. 24. f. 6.

LITHOTHAMNIUM *crassum*, *Phil. in Wieg. Arch.* 1837. p. 388?

HAB. Lying on the sandy bottom of the sea, in 4–5 fathom water. Roundstone Bay, *Mr. Mc'Calla*.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe.

DESCR. *Fronde*s from one to three inches in diameter, roundish or irregularly lobed, composed of a solid central stony mass of no determinate form or size, from which issue in all directions numerous short, thick, cylindrical or laterally compressed, crowded branches divided in an irregularly dichotomous manner, all nearly fastigiate, and remarkably truncated at the tips, which are moreover depressed in the centre. These broad, flattened or subconcave tips are the least variable character of the species. In other respects it is subject to much variety. Sometimes the branches are reduced to mere rudiments, or very much flattened; and sometimes the frond presents little else than an aggregate of thickened tabular pieces. The colour when recent, is a livid purple; when dried, it fades to a dirty white. Under the microscope, after the calcareous matter has been removed by acid, a longitudinal section shows a fibrous surface, marked here and there by obscure zones; and a transverse cutting exhibits a radiate arrangement of the cells. Under a lens of high power, the fibres resolve themselves into delicate, jointed, slightly moniliform filaments, easily separating one from another, toward the surface, but massed together into an irregularly cellular substance, at a greater depth within the frond.

This species would fall under the genus *Lithothamnium* of Philippi, if it be not the same that he has described by the name *L. crassum*. I think it must be by a slip of the pen that Decaisne unites these plants to *Amphiroa*, from which genus they differ in



many ways, while they nearly, or altogether coincide with his own group *Spongites* in *Melobesia*.

Under the preceeding plant I have mentioned that the vegetable nature of the *Corallines* is now distinctly proved. The question still remains, whether the productions here called *Melobesiæ* (*Nulliporæ*, Lam.) are independent vegetables; or whether they be, as has been held by several naturalists, merely amorphous states of the common *Corallina officinalis*. This is the view of the subject advocated by Dr. Johnstone, whose opinion, founded on observation, and as the opinion of an accomplished naturalist who has paid much attention to the lower tribes of animals, and is familiar with variations in form among sponges, nearly as wild as this would be, must not be too hastily condemned. In the present state of my acquaintance with these plants I do not feel myself warranted in giving a direct negative to Dr. Johnstone, although, so far as my opportunities enable me to judge, I am not disposed to agree with his view of the subject. Granting that the base of *Corallina officinalis* is a calcareous expansion resembling the frond of a *Melobesia*, I cannot therefore suppose that objects, like that figured in our last plate, together with the minute *Melobesia pustulata*, found on the leaves of the *Zostera*, are merely such bases which have omitted to develop true fronds. It should be borne in mind that the *Melobesiæ* have their proper organs of *fructification*, and that these are similar in nature to, though slightly different in form from, those of *Corallina*; and this I consider affords the strongest evidence of their independent nature, and the strongest probability of their being fully developed organisms. Still I will not say that it is conclusive evidence; for we must remember that in plants of greatly more perfect organization, the *Orchideæ*, more than one instance has occurred of floral organs so different in structure as to be referable to different genera, having been produced at different times by the same root, and at last occurring together on the same stem! If such things happen among flowering plants, what may we not expect on the confines of the Vegetable Kingdom?

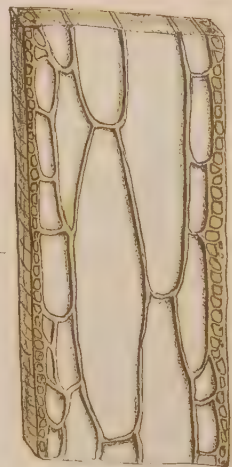
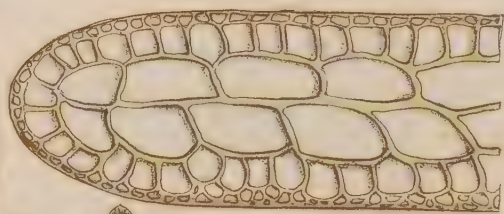
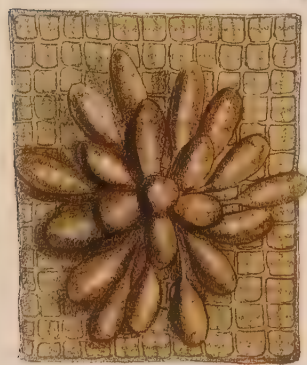
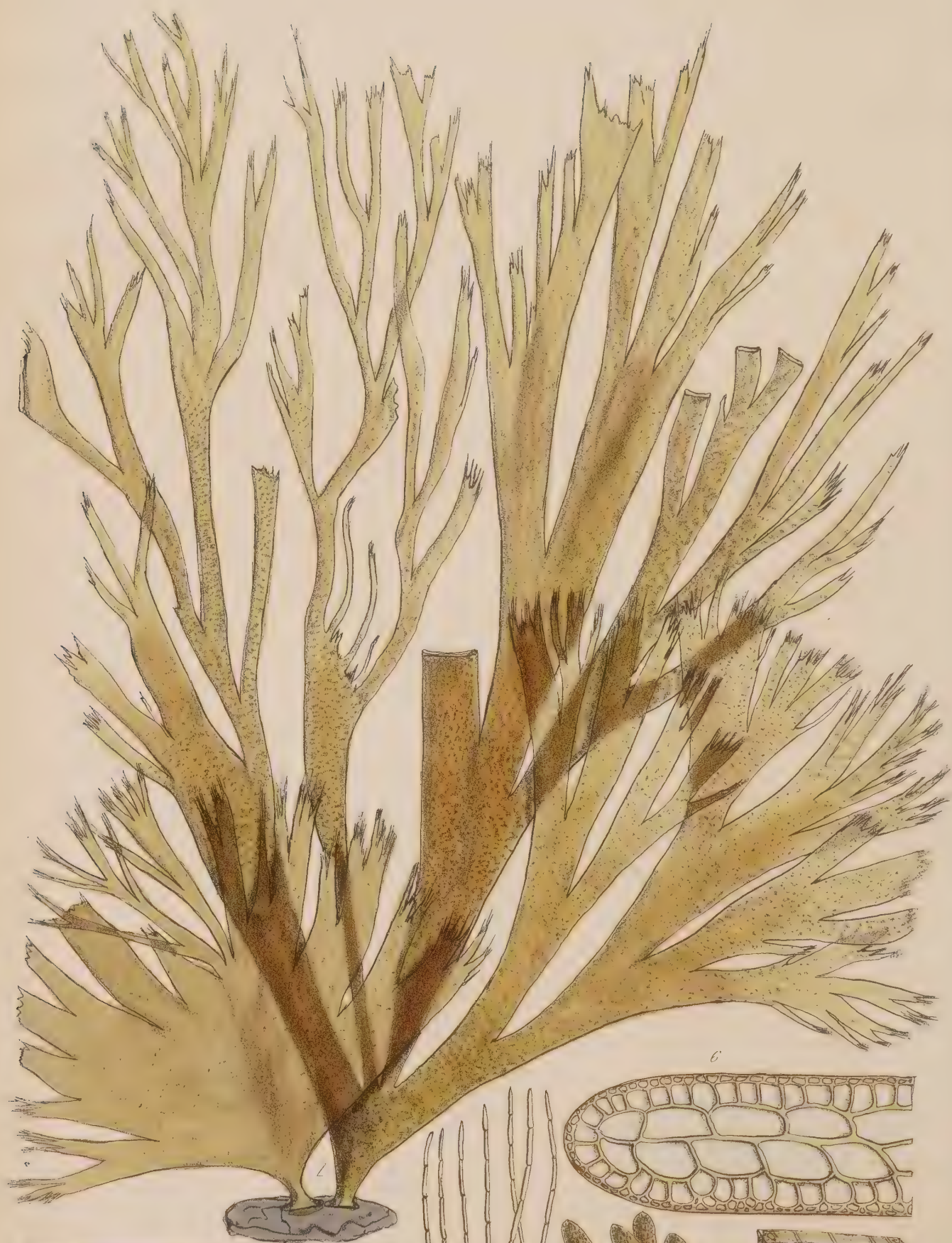
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Fig. 1, 2. MELOBESIA FASCICULATA, different varieties:—*the natural size*. 3. A longitudinal section. 4. A transverse section of a branchlet:—*slightly magnified*. 5. Cellular threads of which the frond is composed:—*highly magnified*.

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## PLATE LXXV.

## CUTLERIA MULTIFIDA, Grev.

GEN. CHAR. *Root* clothed with woolly fibres. *Fron*d flat or compressed, cartilagineo-membranaceous, ribless, somewhat fan-shaped, irregularly cleft or dichotomous. *Fructification*, dot-like tufts of pedicellate *utricles*, scattered over both surfaces of the frond; each utricle containing several *spores*. *Antheridia* on distinct plants, linear, transversely dotted, sessile on the sides of minute tufted filaments, occupying the position of true sori. CUTLERIA (Grev.),—in honour of Miss Cutler, of Sidmouth, a distinguished British Algologist.

CUTLERIA *multifida*; frond thickish, polymorphous, flabelliform, irregularly cleft into numerous narrow laciniaë; axils very acute; apices attenuated, pencilled.

CUTLERIA *multifida*, Grev. *Alg. Brit.* p. 60. t. 10. *Hook. Br. Fl.* vol. ii. p. 281. *Wyatt. Alg. Danm.* n. 61. *Harv. in Mack. Fl. Hib.* pt. 3. p. 177. *Harv. Man.* p. 29. *J. Ag. Alg. Medit.* p. 40. *Menegh. Alg. Ital. et Dalm.* p. 201. *Endl. 3rd Suppl.* p. 25. *Kütz. Phyc. Gen.* p. 339. *Dickie, Ann. Nat. Hist.* v. 14. p. 168.

ZONARIA *multifida*, *Ag. Sp.* vol. i. p. 135. *Syst.* p. 267.

DICTYOTA *penicillata*, *Lamour. in Desv. Journ. Bot.* vol. ii. p. 41. *Lamour. Ess.* p. 58. *Ag. Sp. Alg.* vol. i. p. 139.

DICTYOTA *multifida*, *Bory, Morée*, p. 75. no. 1756

SPOROCHNUS *multifidus*, *Spreng. Syst. Veg.* vol. iv. p. 329.

ULVA *multifida*, *Sm. Eng. Bot.* t. 1913.

HAB. On rocks and shells in the sea, in 4–15 fathoms water. Annual. Summer and autumn. Rare. Yarmouth, *Mr. Turner* and *Mr. Wigg. Seaton* and *Torquay*, *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Brighton, *Mr. Borrer*. Plymouth, *Rev. W. S. Hore*. Bantry Bay, *Miss Hutchins*. Ballycotton, *Miss Ball*. Kilkee and Wicklow, *W. H. H.* Roundstone Bay, *Mr. Mc'Calla*. Not found in Scotland?

GEOGR. DISTR. Coasts of England and Ireland. Atlantic shores of France and Spain. Mediterranean Sea.

DESCR. *Root* an expansion, densely coated with woolly, jointed, branching fibres. *Fron*d from two to twenty inches in length, having a broadly wedge-shaped or fan-shaped general outline, but very variable in its minor divisions. The base is always broadly wedge-shaped, tapering into a short stem from a quarter to half an inch in length. The frond expands upwards, and is then often cleft into numerous wedge-shaped lobes, each of which is repeatedly and very irregularly incised from the apex downwards, the ultimate laciniaë being gradually narrower, and the apices acute. In some specimens the whole frond is cleft nearly to its base into narrow, irregularly dichotomous ribbons, from half a line to a line in breadth; in others the laciniaë are from half an inch to an inch broad, and do not extend below the middle of the frond. In some the apices are regularly fastigate, and the outline nearly circular; in others they are of very various length. When in a perfect state the apices terminate in pencils of delicate jointed filaments (fig. 4), and a net-work of similar, but branching, filaments extends over the whole surface

of the frond, closely investing it; and to this net-work the fructification is attached. *Fructification*, of two kinds, on distinct individuals; 1, pedicellate, oblong *utricles*, each containing about eight spores, clustered in minute tufts, which are plentifully dispersed over both surfaces of the frond, appearing like dots to the naked eye. 2, sausage-shaped or linear, obtuse *antheridia* (?) attached to tufted filaments and scattered, like the utricles, over the whole frond. They are densely zoned with dotted lines. *Substance* cartilaginous, at first crisp, but becoming flaccid; and then, on pressure, closely adhering to paper in drying. *Colour* a foxy olive. *Structure* very lax, the cells of the interior being few, of great size, and colourless.

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*Cutleria multifida* was discovered at Yarmouth by Mr. Dawson Turner, in August, 1804, and first described in English botany by Sir J. E. Smith. Although found on many parts of our coasts it is still considered a rare species, partly, perhaps, from its place of growth being beyond the limit of ordinary tides. Occasionally, after stormy weather, it is washed up in some plenty. The most abundant habitat yet discovered, is at Roundstone Bay, where, last summer, Mr. Mc'Calla dredged a large quantity in a remarkably fine state.

This beautiful plant was selected by Dr. Greville to commemorate the services rendered to British Botany by Miss Cutler, of Sidmouth, whose explorations of her neighbourhood have amply earned "the highest compliment that one botanist can bestow on another." No genus can be more distinct, and few, among the *Dictyotæ*, have a more delicate or curious structure. The fruit is very remarkable. The *antheridia*, described by Dr. Dickie in the 'Annals of Natural History', I have only observed on a specimen sent me by Miss Cutler many years since, but similar bodies appear to be commonly borne by the exotic *C. adspersa*, on my specimens of which species I can find no other fruit. They bear a striking resemblance to the silicular fruit of *Ectocarpus*, and perhaps are organs of a similar nature.

Four species of *Cutleria* are described, with three of which only am I acquainted. Our *C. multifida* is found on all the coasts of southern Europe; *C. laciniata* (which I only know by name), on the French coasts; and *C. adspersa* and *pardalis* in the Mediterranean. The two latter are very like each other, if they be really more than varieties of one species, but both are abundantly distinct from *C. multifida*, though evidently belonging to the same natural genus.

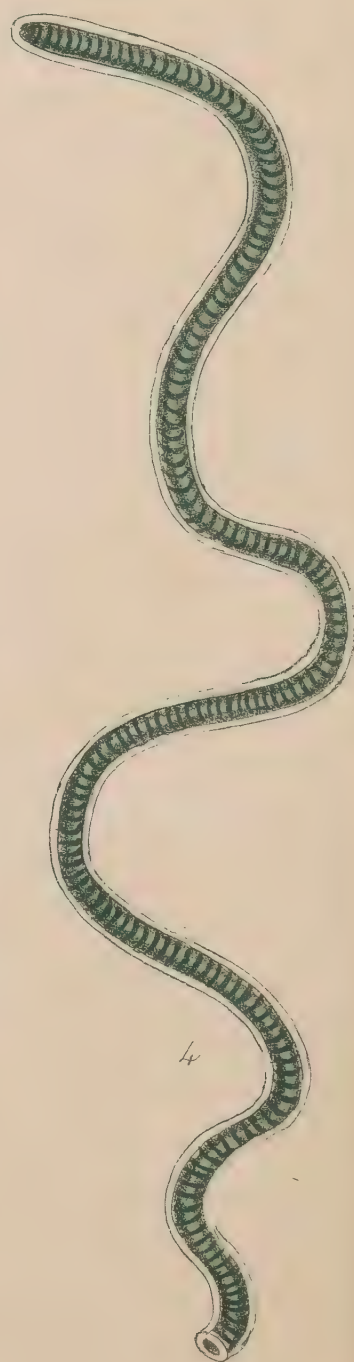
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Fig. 1. CUTLERIA MULTIFIDA:—*natural size*. 2. A sorus of utricles attached to a fragment of the frond. 3. Utricles, separated. 4. Apex of a lacinia. 5. Antheridia. 6. Transverse section of the frond. 7. Longitudinal section:—*all more or less highly magnified*.

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## PLATE LXXVI.

CALOTHRIX PANNOSA, *Ag.*

GEN. CHAR. *Filaments* destitute of a mucous layer, erect, tufted or aggregated, fixed at the base, somewhat rigid, not oscillating. *Tube* continuous; endochrome green, densely annulated, at length dissolving into lenticular sporidia. CALOTHRIX (*Ag.*),—from *καλὸς*, *beautiful*, and *θρίξ*, *hair*.

CALOTHRIX *pannosa*; filaments elongate, rigid, very much curled and twisted, obtuse, densely interwoven together into lamellated tufts or honey-combed strata; endochrome blackish green, densely annulated.

CALOTHRIX *pannosa*, *Ag. in Bot. Zeit.* vol. x. p. 635. no. 42. *Endl.* 3rd *Suppl.* p. 13.

CALOTHRIX *lamellata*, *Harv. in Herb.* 1842.

HAB. Near high-water mark, growing either on rocks, on *Fucus canaliculatus*, or on *Corallina officinalis*, &c. Perennial. Kilkee, *W. H. H.* Roundstone Bay, *Mr. Mc' Calla*. Sidmouth, *Rev. R. Cresswell*.

GEOGR. DISTR. Adriatic Sea, at Trieste, *C. Agardh*.

DESCR. *Filaments* rigid, from a quarter to half an inch in length, very much curled, equal in diameter throughout, obtuse, very densely and intricately woven together, forming thin laminae, which are either packed together in an irregular stratum with a bristling surface, or arranged with some regularity in a manner resembling honey-comb, small roundish or angular spaces being left between the laminae, which unite at the edges in a sort of net-work. According to the object on which it grows, the plant varies; that on the rock being more regularly honey-combed, and also more luxuriant than that which grows on Algæ. *Endochrome* dark green, closely annulated with strongly marked striæ.

I first observed this species at Kilkee, in the spring of 1842, growing on *Corallina officinalis*, in rock pools near high water mark, a situation occasionally selected by the Coralline, but where it seldom reaches perfection. Believing at the time that my specimens belonged to an undescribed species, I communicated them to several friends under the manuscript name, *C. lamellata*. More recently I was pleased at receiving the same plant from the Rev. Mr. Cresswell, of Sidmouth; and last summer, when at Roundstone, Mr. Mc' Calla pointed out to me a locality in which it grows in great abundance and perfection, spreading over every

object which comes in its way. From some of the latter specimens our figure has been taken.

It obviously differs in many characters, from any British species, but I am not prepared to say that it agrees with Agardh's plant gathered at Trieste. Of the latter I have seen no specimen, and form my judgment merely on the short description given by Agardh in the 'Bot. Zeitung', which completely answers to our plant. A comparison with authentic specimens would be very desirable.

From Mr. Cresswell I have also received another new *Calothrix*, having many characters in common with *C. pannosa*, but occurring in cushion-like, soft, fastigate tufts, and with filaments very much more slender and hyaline than in that species. This last I propose to call *C. Cresswellii*, and to figure in a future number of this work.

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Fig. 1. CALOTHRIX PANNOSA:—*the natural size*, growing partly on a piece of rock, partly on *Fucus canaliculatus*. 2. Part of the stratum:—*slightly magnified*, to show the honey-combed surface. 3. Filaments, twisted together. 4. Portion of a filament:—*highly magnified*.

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## PLATE LXXVII.

CALLITHAMNION TRIPINNATUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; *stem* either opaque and cellular, or translucent and jointed; branches jointed, one tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches and containing numerous angular *spores*. CALLITHAMNION (*Lynbg.*),—from κάλλις, *beautiful*, and θαμνίον, *a little shrub*.

CALLITHAMNION *tripinnatum*; frond distichously branched, capillary, decomposito-pinnate; plumules elongate, obovate, tripinnate above; upper pinnæ elongate, and pinnulate, lower short or abortive, each pinna having at its axil a minute pinnule; pinnules long, setaceous; joints of the stem 3–4 times, of the pinnæ about twice as long as broad; tetraspores oval, lateral on the axillary, and occasionally on the other pinnules.

CALLITHAMNION *tripinnatum*, *Ag. Sp. Alg.* vol. ii. p. 168. *J. Ag! Alg. Medit.* p. 72. *Endl. 3rd Suppl.* p. 34. no. 23 (*but not of Harv. in Hook. Br. Fl.* vol. ii. p. 346. nor of *Wyatt, Alg. Danm.* p. 186.).

MERTENSIA *tripinnata*, *Gratel. MS. sec. Ag.*

HAB. On marine rocks, at extreme low water mark. Annual. April, May. Very rare. Roundstone Bay, *Mr. Mc Calla*.

GEOGR. DISTR. Coast of France, *Grateloup*. Mediterranean Sea, *J. Agardh!* West of Ireland, very rare.

DESCR. *Fronds* tufted, from one to two inches high, capillary, membranaceous, not gelatinous, perfectly distichous, having a circumscribed, somewhat fan-shaped outline, about triply pinnate; the primary pinnæ, or *plumules* (one of which is represented at figure 2) having a narrow obovate outline, their lower pinnæ being very short, and simple, those approaching the middle of the rachis, gradually longer, those just beyond the middle longest, and those from thence to the apex gradually shorter. The upper and middle pinnæ have their upper half furnished with slender, setaceous, elongate, patent, alternate pinnules; their lower half naked, except the basal joint, which bears, almost invariably, at its upper side, or in the axil of the pinna, a solitary, and very frequently fertile, pinnule. Except for this basal pinnule, the lower pinnæ are quite naked, and generally very short or abortive. All the divisions are alternate. The joints of the stem and branches are pellucid, from three to four times longer than broad, cylindrical or somewhat swollen at the nodes; those of the pinnules are about twice as long as broad. *Tetraspores* oval, with wide borders, secund along the upper edge of the ultimate pinnules, very commonly on the axillary one. *Favellæ* unknown. *Colour* a full dark red. *Substance* delicate, and closely adhering to paper in drying.



Having, in the 'British Flora', committed the error of describing a variety of *C. thuyoides* under the name *C. tripinnatum*, an error unfortunately continued in Wyatt's admirable 'Algæ Danmonienses', I have peculiar satisfaction in affording to the British botanist a figure of the *true* plant, of which I am the more certain, having compared our Irish specimens with one communicated to me from the Mediterranean, by my friend Professor J. Agardh. Notwithstanding some slight differences, I cannot but regard the Irish plant as belonging to the same species as that from Cète. The latter is more luxuriant, rather more robust, and has the ultimate ramuli rather longer, and perhaps it is more irregularly branched than ours. But the *main* character,—that by which the species is chiefly distinguished,—of having a minute ramulus on the first joint of the pinnæ, is common to both.

Though the habit of *C. tripinnatum* is very like that of *C. gracillimum*, it will be perceived that its microscopic characters have a greater resemblance to those of *C. Borreri*, from which the axillary ramulus, and the distichous growth chiefly separate it.

Mr. Mc'Calla has, as yet, found very few specimens, and these accompanied *C. thuyoides*, growing on the perpendicular sides of steep rocks at the extreme limit of low water. No other British station has yet been observed, but it can hardly be doubted that it will yet be added to the Flora of Devonshire or Cornwall. Grateloup's specimens were probably collected on the opposite shores of the channel.

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Fig. 1. CALLITHAMNION TRIPINNATUM:—*the natural size*. 2. A *plumule* or pinnated-branch. 3. One of the smaller pinnæ. 4. A pinnule, with *tetraspores*:—*all more or less highly magnified*.

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## PLATE LXXVIII.

HIMANTHALIA LOREA, *Lyngb.*

GEN. CHAR. *Frond* top-shaped. *Receptacles* very long, strap-shaped, repeatedly forked, springing from the centre of the frond, filled with mucus traversed by jointed fibres, and pierced by numerous pores, which communicate with immersed spherical *conceptacles*, containing either parietal *spores*, or (in distinct individuals) *antheridia*. HIMANTHALIA (*Lyngb.*)—from ἵμας, a *strap*, and θάλος, a *branch* (or ἄλς, the *sea*.)

HIMANTHALIA *lorea*; frond top-shaped, at length cup-shaped, stalked; receptacles repeatedly dichotomous, tapering more or less at the apex.

HIMANTHALIA *lorea*, *Lyngb. Hyd. Dan.* p. 36. t. 8. *Grev. Fl. Edin.* p. 285. *Gaill. in Dict. Sc. Nat.* vol. 53. p. 357. *Grev. Alg. Brit.* p. 20. t. 3. *Hook. Br. Fl.* vol. ii. p. 269. *Wyatt, Alg. Danm.* no. 3. *Harv. in Mack. Fl. Hib.* part 3. p. 170. *Harv. Man.* p. 22. *Kütz. Phyc. Gen.* p. 351. *Endl. 3rd Suppl.* p. 29.

FUCUS *loreus*, *Linn. Syst. Nat.* vol. ii. p. 716. *Gm.* vol. ii. p. 1382. *Huds. Fl. Ang.* p. 583. *Lightf. Fl. Scot.* p. 920. *Fl. Dan.* t. 710. *With. Ar.* vol. iv. p. 96. *Stack. Ner. Brit.* p. 37. t. 10. *E. Bot.* t. 569. *Turn. Syn. Fuc.* vol. ii. p. 246. *Hist.* t. 196. *Lamour. Ess.* p. 19. *Ag. Sp. Alg.* vol. i. p. 98. *Ag. Syst.* p. 280. *Spreng. Syst. Veg.* vol. iv. p. 316.

FUCUS *elongatus*, *Linn. Sp. Pl.* vol. ii. p. 1627 (*excl. syn. Moris*). *Syst.* vol. ii. p. 716. *Gm.* vol. ii. p. 1381. *Gm. Hist. Fuc.* p. 103. (*excl. syn. Huds.*).

FUCUS *longo angusto crassoque folio*, *Raii. Syn.* p. 43. n. 11.

FUCUS *fungis affinis*, *Raii. l. c.* p. 43. n. 15.

HAB. On rocky sea shores, near low water mark. Annual? Winter and spring. Common.

GEOGR. DISTR. Atlantic shores of Europe from Iceland (*Mohr.*) to Portugal (*Brotero*). Eastern coast of North America.

DESCR. *Root* scutate *Fronds* tufted, when young narrow obconical, gradually becoming wider above, and finally being top-shaped, depressed in the centre, with an expanded circular rim, thus becoming slightly cup-shaped, or pezizæform. *Receptacles* springing from the centre (i.e. the apex) of the cup-like frond, varying in length from two to ten, or according to some authors, to twenty feet; from a quarter to half an inch in width, compressed, linear, repeatedly dichotomous, tapering at the apices into more or less acute points. Internally these receptacles are filled with a watery gelatine traversed by confervoid filaments. Their outer coat is firmly cellular, and pierced by numerous pores beneath each of which is formed a small spherical chamber or conceptacle. The fructification is diœcious. In some individuals the conceptacles contain tufts of *antheridia*, attached to branching filaments, similar to those of *Fucus*. In others they contain, immersed

among confervoid filaments, three or four large, roundish, olive-coloured spores, which divide internally at maturity into four sporules. *Colour*, a dark olive, occasionally pale yellowish. *Substance* coriaceous.

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This well-known plant, which, with some schooling, we have contrived to bring within the narrow compass of our plate, is very common on most of the rocky Atlantic coasts of Europe and North America, but is not found in the Mediterranean.

Authors are at variance as to its duration; Turner and Carmichael asserting that it is a *perennial*; Greville and Mrs. Griffiths that it is *annual*. Certain it is that the plant appears to reach to its full growth within the year, and that vast multitudes of fronds then decay; while their receptacles are detached, and drift ashore in tangled strata. Possibly some survive to a second season, and throw out new receptacles; for I am unwilling to set aside the evidence of so close an observer as the late Captain Carmichael, who declares that he has seen old fronds which had shed their first receptacles, throw out others, which latter frequently spring, according to the same authority, from some eccentric point of the disc. I have, I must add, repeatedly and in vain sought for instances of this second growth, and am therefore disposed to regard the species as being, under common circumstance, an annual,—granting that it may occasionally be biennial, from the influence of local causes.

The common name is Sea Thongs, of which the lengthy Greek by which it is known to botanists is nearly a literal translation. It is used in the manufacture of Kelp, in which salt it is said to be rich, though inferior in this respect to some of the true *Fuci*.

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Fig. 1. HIMANTHALIA LOREA, a small specimen:—*the natural size*. 2. Cross section of the receptacle. 3. Enlarged view of a *conceptacle*:—*in situ*. 4. A spore, containing four sporules, and surrounded by hyaline filaments.

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## PLATE LXXX.

PTILOTA PLUMOSA, *Ag.*

GEN. CHAR. *Frond* inarticulate, linear, compressed or flat, distichous, pectinato-pinnate; the pinnules sometimes articulate. *Fructification*, of two kinds, on distinct individuals; 1, *tetraspores* attached to, or immersed in the ultimate pinnules; 2, roundish, clustered, *receptacles* (*favellæ*) surrounded by an involucre of short ramuli. Ptilota (*Ag.*) —from *πτίλωτος*, *pinnated*.

PTILOTA *plumosa*; frond cartilaginous, decompose; secondary branches bi-tripinnate, elongate; pinnæ and pinnules exactly opposite, the latter subulate, cellular, traversed by a narrow, immersed, jointed filament; tetraspores on short pedicels, fringing the margin of the pinnules; flavellæ pedunculate, with an involucre of 6–8 subulate ramuli.

PTILOTA *plumosa*, *Ag. Sp. Alg.* vol. i. p. 385. (*excl. var. β.*) *Ag. Syst.* p. 195. *Lyngb. Hyd. Dan.* p. 38. t. 9. *Grev. Fl. Edin.* p. 297. *Spreng. Syst. Veg.* vol. iv. p. 344. *Hook. Fl. Scot.* part 2. p. 106. *Grev. Alg. Brit.* p. 155. t. 16. *Hook. Br. Fl.* vol. ii. p. 84. *Harv. in Mack. Fl. Hib.* part 3. p. 204. *Harv. Man.* p. 84. *Endl. 3rd Suppl.* p. 36. *Post. and Rupp.* p. 16. *Kütz. Phyc. Gen.* p. 378. t. 46. f. 6.

CERAMIUM *plumosum*, *Roth. Cat. Bot.* vol. iii. p. 133. *Ag. Dist.* p. 17.

PLOCAMIUM *plumosum*, *Lamour. Ess.* p. 50.

FUCUS *plumosus*, *Linn. Mant.* p. 134. *Syst. Nat.* vol. ii. p. 718. *Huds. Fl. Angl.* p. 587. *Gm. Hist. Fuc.* p. 152. *Fl. Dan.* t. 350. *Lightf. Fl. Scot.* vol. ii. p. 955. *With.* vol. iv. p. 120. *Esper. Ic. Fuc.* vol. i. p. 92. t. 45. *Fl. Norv.* vol. ii. p. 91. *Linn. Trans.* vol. iii. p. 188. *Turn. Syn. Fuc.* vol. ii. p. 296. *Turn. Hist. Fuc.* t. 60 (*excl. var. β.*). *Eng. Bot.* t. 1308.

HAB. Parasitical on the stems of *Laminaria digitata*. Perennial. Summer and autumn. Frequent on the shores of Scotland, and of the north and west of Ireland. Holyhead, *Mr. Ralfs*. Scarborough, —.

GEOGR. DISTR. Distributed throughout the Arctic, the North Atlantic and North Pacific Oceans. Davis's Strait, *Turner*. Iceland, *Æder*. White Sea, Greenland, Sitka, Unalaska, *Postels* and *Rupprecht*. Arctic America, *Richardson*. Kamtschatka, *Bongard*. Norway and Sweden.

DESCR. *Root* scutate. *Fronds* tufted, 4–12 inches in length, compressed, linear, from the thickness of a hog's bristle to nearly a line in diameter, irregularly divided. Secondary branches distichous, 1–3 inches in length, patent, linear-oblong or obovate in circumscription, bi-tripinnate, the pinnæ and pinnules very patent, scarcely a line asunder, gradually increasing in length toward the middle of the branch, and diminishing to the apex. Ultimate *pinnules* closely pectinate, awl-shaped, acute, cartilaginous, sub-opaque, their outer coat formed of numerous angular cellules, through which is visible a jointed

axis or string of large cells, which runs through the pinnule as well as (with some modification) through every part of the frond. *Fructification*; 1, roundish, tripartite, external tetraspores seated on minute pedicels, which fringe the margin of slightly abbreviated pinnules; 2, on distinct plants, clustered *favellæ*, surrounded by an involucre of several subulate ramuli, and borne on the apex of abbreviated pinnules. *Colour* a dark, full red, occasionally with a brownish tinge. *Substance* cartilaginous, rather rigid, more or less perfectly adhering to paper in drying.

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Our figure and description apply solely to the var. *α*. of Turner, which, though abundant on the shores of Scotland and the north and west of Ireland, is rare in England, and quite unknown on our southern shores. As far as my experience goes it invariably grows on the stems of *Laminaria digitata*, which it often clothes with a rich feathery fringe. The var. *β*. of Turner, which is the common plant of the south of England, as invariably grows on rocks; and preserves its characters so constantly that I cannot help regarding it, with Kützinger, as a distinct species. In doing so I am reluctantly compelled to dissent from the opinion of Mr. Turner, who says, "that no *Fucus* whatever exhibits more regular gradations between the most narrow and delicate, and the broadest and most cartilaginous individuals; in consequence of which no attempt was ever previously made to separate it into different varieties." I cannot observe this gradation; to me the two forms appear to be easily distinguishable by the naked eye in every case; and present very distinct microscopic characters. Besides this, their geographical range and habitat are different; for though on our northern shores both are found, yet further north the var. *α*. alone is met with; and further south, as on the southern shores of England and the shores of France and Spain, the var. *β*. is exclusively seen. Add to this, that the first is never found on rocks, and the last always is; that the parasites which commonly infest them are different; that one is a far stouter and more cartilaginous plant than the other; that the microscopic appearance of their pinnules is very dissimilar; and we shall, I think, have sufficient specific characters to separate them.

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Fig. 1. *PTILOTA PLUMOSA*:—*of the natural size*. 2. A pectinated pinnule. 3. One of the ultimate laciniae. 4. An involucre. 5. Favellæ, removed from the same. 6. A lacinia bearing tetraspores. 7. One of the tetraspores:—*more or less highly magnified*.

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## PLATE LXXXI.

CALLITHAMNION FLOCCOSUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; *stem* either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*)—from κάλλις, *beautiful*, and θάμνιον, *a little shrub*.

CALLITHAMNION *floccosum*; frond capillary, very flaccid, remotely much branched; branches alternate, erecto-patent, articulated; every joint producing a pair of opposite, simple, subulate, erecto-patent, minute ramuli; tetraspores elliptical, pedicellate, produced on the ramuli, near their base.

CALLITHAMNION *floccosum*, *Ag. Sp. Alg.* vol. ii. p. 158. (*excl. Syn.* Dillw.) *Endl. 3rd Suppl.* p. 34.

CALLITHAMNION *plumula*, *Lyngb. Hyd. Dan.* p. 127. (*excl. var. β.*)

CALLITHAMNION *Pollexfenii*, *Harv. in Ann. Nat. Hist.* vol. xiv. p. 186. t. 5. f. 5—7.

CONFERVA *floccosa*, *Fl. Dan.* t. 828.

HAB. On submarine rocks, near low-water mark. Annual. Spring. Very rare. Orkney Islands, *Rev. J. H. Pollexfen.* Aberdeen. *Dr. Dickie.*

GEOGR. DISTR. Coast of Norway. North of Scotland.

DESCR. *Fronds* densely tufted, from one to four inches in length, capillary, very flaccid, irregularly divided into several principal branches, in an alternate or subdichotomous manner, the furcations rather distant; main branches either naked or furnished at intervals with short, closely branched or multifid lateral secondary branches, having an obovate outline; all the divisions alternate, the axils acute, and the branches and their secondaries erecto-patent or erect. *Filaments* pellucidly articulate throughout, the articulations from two to four times as long as broad, each having a pair of opposite, subulate, simple, minute ramuli, not half a line in length, springing from a short distance above the middle of the articulation. *Tetraspores* elliptical, borne on short, accessory processes of the ramuli, issuing either on the inner or outer face. *Favellæ* unknown in this country.

In the year 1840, I received, from the Rev. J. H. Pollexfen, a specimen of this plant, gathered by him, in the previous summer, in one of the bays of the Orkney Islands, and not finding it to agree with the specific character of any species published



by Agardh, I published it as new, in the ‘Annals of Nat. History for 1844, under the name of *C. Pollexfenii*, as a just tribute to its acute discoverer. At that time I had no suspicion that it could be the *C. floccosum* of Agardh, because the character he gives “ramellis oppositis ascendenti-patentibus sursum pectinato-pinnatis, pinnis simpliciusculis,” by no means answers to the present individual, and agrees very well with a common variety of *C. Plumula*. Forming my judgment on the words “sursum pectinato-pinnatis;” as well as on Agardh’s reference to Dillwyn’s Plate 50. f. A, and on the note appended to his description, “Hinc hæc icon semper nobis dubia fuit, usque dum Hookerus specimen *Confervæ Plumulæ*, Dillw. misit, quod omnia explicavit, et nobis persuasit, dua individua diversæ speciei picta esse;” I could not believe otherwise than that his *C. floccosum* was founded on a bad specimen of *C. Plumula*, for I knew that Sir W. J. Hooker could never have sent Agardh a specimen of my *C. Pollexfenii*, which did not exist in his Herbarium, until Dr. Dickie communicated it in 1844; and still less could it have been the plant intended by Dillwyn’s figure. Were there no other grounds, therefore, for upholding Agardh’s *C. floccosum*, than the description he has given of it, that species must be erased, and its synonymes transferred to *C. Plumula*. But the real foundation of *C. floccosum* rests, on the figure in ‘Flora Danica,’ and the description given by Lyngbye, in his excellent work, above quoted. My error consisted in having omitted to refer to that figure and description; for though the figure is not very accurate, yet it certainly is more characteristic of our plant than of *C. Plumula*; while the description given by Lyngbye, and which was taken from an authentic specimen of the plant figured in ‘Flora Danica,’ answers in all respects to my *C. Pollexfenii*. I am compelled, therefore, to restore the specific name, under which this species was first published.

*C. floccosum* would appear to be peculiarly a northern plant, confined, so far as we know, to the coasts of Norway, and the north of Scotland,—in both which countries it is of extreme rarity.

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Fig. 1. *CALLITHAMNION FLOCCOSUM*;—of the natural size.<sup>1</sup> 2. A branch:—magnified. 3. Portion of the same. 4. Ramuli with tetraspores. 5. A tetraspore:—highly magnified.





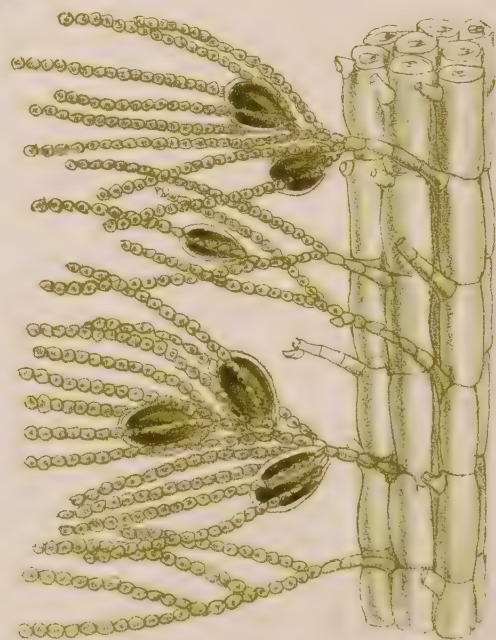
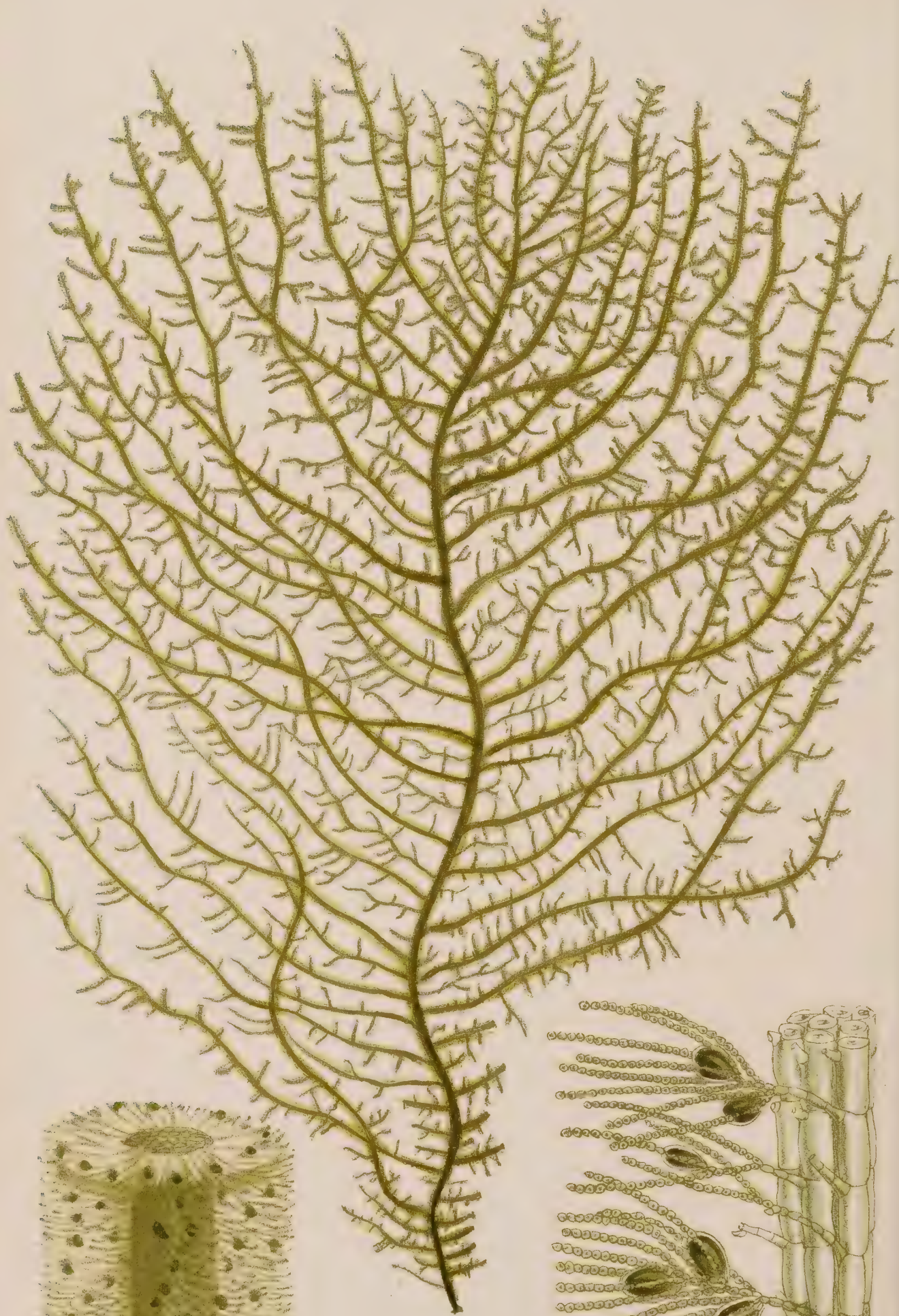




PLATE LXXXII.

MESOGLOIA VIRESCENS, *Carm.*

GEN. CHAR. *Frond* filiform, much branched, gelatinous. *Axis* composed of loosely packed, longitudinal, interlaced filaments, invested with gelatine; the *periphery* of radiating, dichotomous filaments whose apices produce clusters of club-shaped, moniliform fibres. *Fructification*, obovate spores, seated among the apical fibres. MESOGLOIA (*Ag.*) from μέσος, the *middle*; and γλοιός, *viscid*; in allusion to the gelatinous axis.

MESOGLOIA *virescens*; frond filiform, gelatinous; branches long, slender, villous; ramuli numerous, patent, short, linear, obtuse.

MESOGLOIA *virescens*, *Carm. Alg. Appin. ined. Hook. Br. Fl.* vol. ii. p. 387. *Wyatt, Alg. Danm.* no. 49. *Berk. Gl. Alg.* t. 17. f. 2.

MESOGLOIA *affinis*, *Berk. Gl. Alg.* t. 16. f. 2.

MESOGLOIA *Hornemanni*, *Suhr.?* *Kütz. Phyc. Gen.* p. 332?

TRICHOCLADIA *virescens*, *Harv. in Mack. Fl. Hib.* part 3. p. 184.

HELMINTHOCLADIA *virescens*, *Harv. Man.* p. 46.

β, *Zostericola*; frond brownish, simple, with a few short branches.

MESOGLOIA *gracilis*, *Carm. Alg. Appin. ined. Berk. Gl. Alg.* t. 17. f. 1. *Endl. 3rd Suppl.* p. 23.

MESOGLOIA *Zosteræ*, *Aresch.*

RIVULARIA *Zosteræ*, *Mohr. in Weber. Beitr.* vol. ii. p. 367. *Lyngb. Hyd. Dan.* p. 194. t. 66.

HAB. On rocks, stones, and Algæ, at half-tide level. Annual. Spring and Summer. Common. West of Scotland, *Carmichael, Rev. D. Landsborough, &c.* North of Ireland, *Mr. W. Thompson.* West, south, and east of Ireland, abundant. South coast of England, *Mrs. Griffiths, &c.* β, parasitical on *Zostera*, at Appin, *Capt. Carmichael.* Roundstone Bay, *Mr. Mc'Calla.*

GEOGR. DISTR. Northern shores of Europe. Baltic Sea. Atlantic coasts of France.

DESCR. *Root* scutate. *Frond* from four to twelve or fourteen inches in length, and from half to nearly a line in diameter, cylindrical, filiform, equal in diameter throughout its extent, with an undivided stem, densely clothed with lateral branches. *Branches* issuing at short distances from each other, sometimes as long as the stem, sometimes half as long, and in var. β. very short, patent, resembling the main stem, and like it having numerous, lateral, simple or forked, patent secondary branches. Every part of the frond appearing villous to the naked eye from the great length, and little density of the stratum of filaments, which form the periphery. These *filaments* are irregularly dichotomous or somewhat fascicled; their divisions moniliform,

and of equal diameter throughout. *Colour* a yellowish or greenish olive. *Substance* tender, gelatinous and slippery. *Fructification*, elliptical spores attached to the bases of the filaments of the periphery. Our variety,  $\beta$ , regarded by some authors as a distinct species, only differs in being of smaller size, with less compound ramification; there is no microscopic character to distinguish it.

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An abundant species, on all our coasts, from the north of Scotland to Cornwall, and subject to little variation except in the amount of its ramification. Sometimes the branches are even more densely set than our figure represents; often they are more distant, and occasionally the frond is very much less divided. In the variety  $\beta$ , especially, which grows on the leaves of the *Zostera*, the main stem seldom exceeds three or four inches in length, and its branches are frequently rudimentary. I do not think, however, that it has sufficient characters to found a species upon.

The appearance of a branch of this species under the microscope is very beautiful, owing to the great length, and full greenish olive hue of the filaments composing the periphery, which are set in a looser gelatine than in any other of our British kinds, and give the frond a singularly villous appearance, to the naked eye. In this respect it differs from *M. Griffithsiana* which is of a much, firmer and more compact substance.

The *Mesogloia affinis*, of Berkeley, would appear, by the figure and description, to be only the young of *M. virescens*; and though I have not seen *M. Hornemanni*, Suhr., yet the description given of it by Kützinger, accords so well with specimens of *M. virescens*, communicated to me by Senator Binder, of Ham-burgh, from Heligoland, that I have no hesitation in considering it a synonyme.

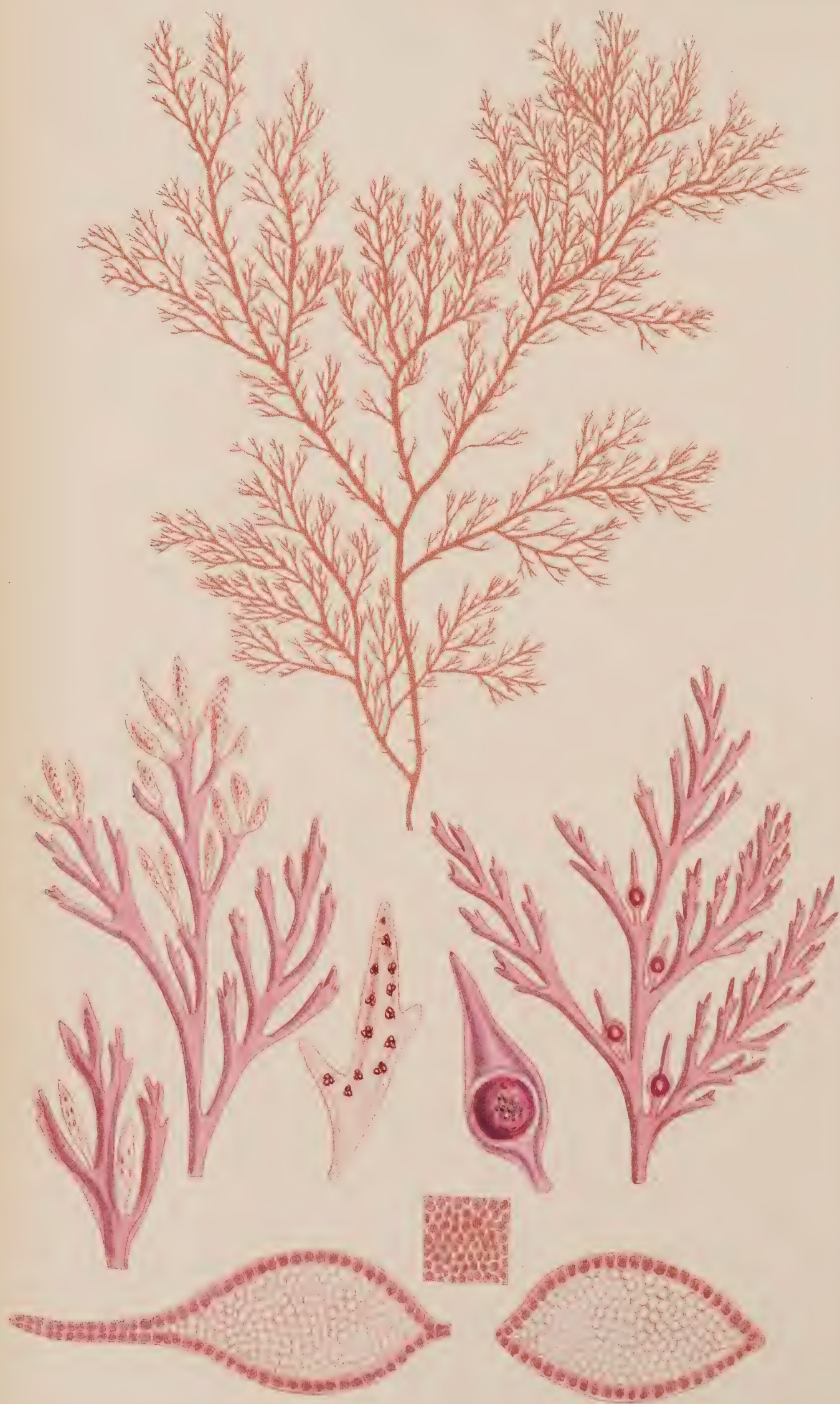
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Fig. 1. *MESOGLOIA VIRESCENS*:—*of the natural size*. 2. Portion of the frond:—*slightly magnified*. 3. Filaments of the periphery, and some of those of the axis:—*highly magnified*.

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## PLATE LXXXIII.

DELESSERIA ANGUSTISSIMA, *Griff. MSS.*

GEN. CHAR. *Frond* rose-red, flat, membranaceous,\* with a percurrent midrib. *Fructification* of two kinds, on distinct individuals; 1, spherical *tubercles* (*coccidia*) immersed in the frond, and containing a globular mass of angular spores; 2, *tetraspores* forming defined spots in the frond, or in leaf-like processes. DELESSERIA (*Ag.*),—in honour of *Baron Benj. Delessert*, a distinguished botanist and patron of botany.

DELESSERIA *angustissima*; frond membranaceo-cartilaginous, compressed, very narrow, two-edged, much branched; branches alternate, distichous of unequal length, much divided above, and furnished with numerous forked ramuli; tubercles imbedded either in the tips of the frond, or in small axillary ramuli; tetraspores forming sori (on distinct plants) either in the inflated apices, or in axillary, lanceolate ramuli.

DELESSERIA *alata*,  $\gamma$ . *angustissima*, *Ag. Sp. Alg.* vol. i. p. 179. *Ag. Syst.* p. 250. *Grev. Alg. Brit.* p. 74. *Hook. Br. Fl.* vol. ii. p. 286.

DELESSERIA *alata*,  $\beta$ . *angustifolia*, *Lyngb. Hyd. Dan.* p. 8. (?)

RHODOMENIA *rostrata*, *J. Ag. MSS.*

GIGARTINA *purpurascens*,  $\gamma$ . *rostrata*, *Lyngb. Hyd. Dan.* p. 46. t. 12. *fide J. Ag.* (but the figure is not characteristic).

GELIDIUM? *rostratum*, *Griff. in Harv. Man.* p. 82.

FUCUS *alatus*,  $\gamma$ . *angustissimus*, *Turn. Syn. Fuc.* vol. i. p. 145. *Turn. Hist.* t. 160. fig. *k-l*.

FUCUS *alatus*, junior, *Gm. Hist.* t. 25. f. 2.

HAB. Parasitical on the stems of *Laminaria digitata*, often accompanying *Del. alata*. Perennial. Winter and Spring. Scarborough, *Mr. Pitchford*. Lossiemouth, Morayshire, *Mr. Brodie*. Aberdeen, *Dr. Dickie*. Orkney, *Rev. J. H. Pollexfen*. Galway, *Mr. Reilly*. Cornwall, *Mr. Ralfs*. Kingstown, *Mr. Andrews*.

GEOGR. DISTR. Arctic Sea, and Northern Atlantic Ocean. Greenland. Norway?

DESCR. *Root*, a small disc. *Fronds* tufted, 4–8 inches long, nearly cylindrical below, compressed and two-edged above, not half a line in diameter, becoming gradually more slender towards the tips, much and irregularly branched. *Branches* distichous, irregular, alternate or subdichotomous, frequently bare of ramuli in their lower part; above more or less amply furnished with patent, once or twice forked, ramuli from a quarter to half an inch in length. *Apices* acute. *Colour* a very dark red. *Substance* cartilaginous, rather flaccid. *Fructification*; 1, *tubercles* mostly immersed in small accessory ramuli, springing from the axils of the upper branches, spherical, containing a moderately dense mass of spores, sometimes immersed in the apices of the frond. 2, *tetraspores* contained in the inflated tips of the branches, or in small, simple or forked, spindle-formed, accessory ramuli, seated in the axils of the upper branches.

\* In this species the *membrane* is obsolete, the frond consisting altogether, or very nearly, of midrib.

It is nearly forty years since Mr. Brodie first noticed the plant here figured, and sent specimens to Mr. Turner, by whom they were then considered to be a variety, which he called *angustissima*, of *Delesseria alata*; and in this judgment he was generally followed till the year 1840, when, in deference to the repeated protests of Mrs. Griffiths, I ventured, in the 'Manual,' to separate and describe Mr. Brodie's plant under the temporary name of *Gelidium? rostratum*, recommending it to the notice of observers, and adding that "my own opinion on this puzzling matter was not very decided."

Were all the specimens now before me equally characteristic as the one I have figured, I should have no hesitation in adding mine to the other opinions in favour of this plant; but unfortunately I possess some, in which I can clearly trace the compressed edge of the frond passing into a very narrow membrane; and others which seem to be exactly intermediate between very narrow *alata*, and true *angustissima*. I am therefore now persuaded that Mr. Turner's judgment was strictly correct; and Dr. Dickie, who has had the best opportunities of studying it in its living state, writes, "Both plants grow together upon *Lam. digitata*; both are in fruit at the same time; and in making up packets of duplicates I have often been puzzled whether to call my specimens *G. rostratum* or *D. alata*."

Mrs. Griffiths, however, adheres to her already recorded opinion. "I have always", she says, "acted on the maxim of my first instructor, Bishop Goodenough, who in one of his early letters wrote, '*never let what I or any one else may say weigh against the evidence of your own senses*'; therefore, when I see the young, tender and perfect shoots of one plant furnished with a membrane, however bare the rest of the plant may be, and the equally young and tender shoots of another perfectly naked, though some of the branches are compressed, I must decide that they are not the same species, particularly as the difference has been constant for so many years." Whichever opinion be eventually adopted, it must at least be acknowledged that *D. angustissima* is a very *remarkable form*, and as such deserving of a place in this work.

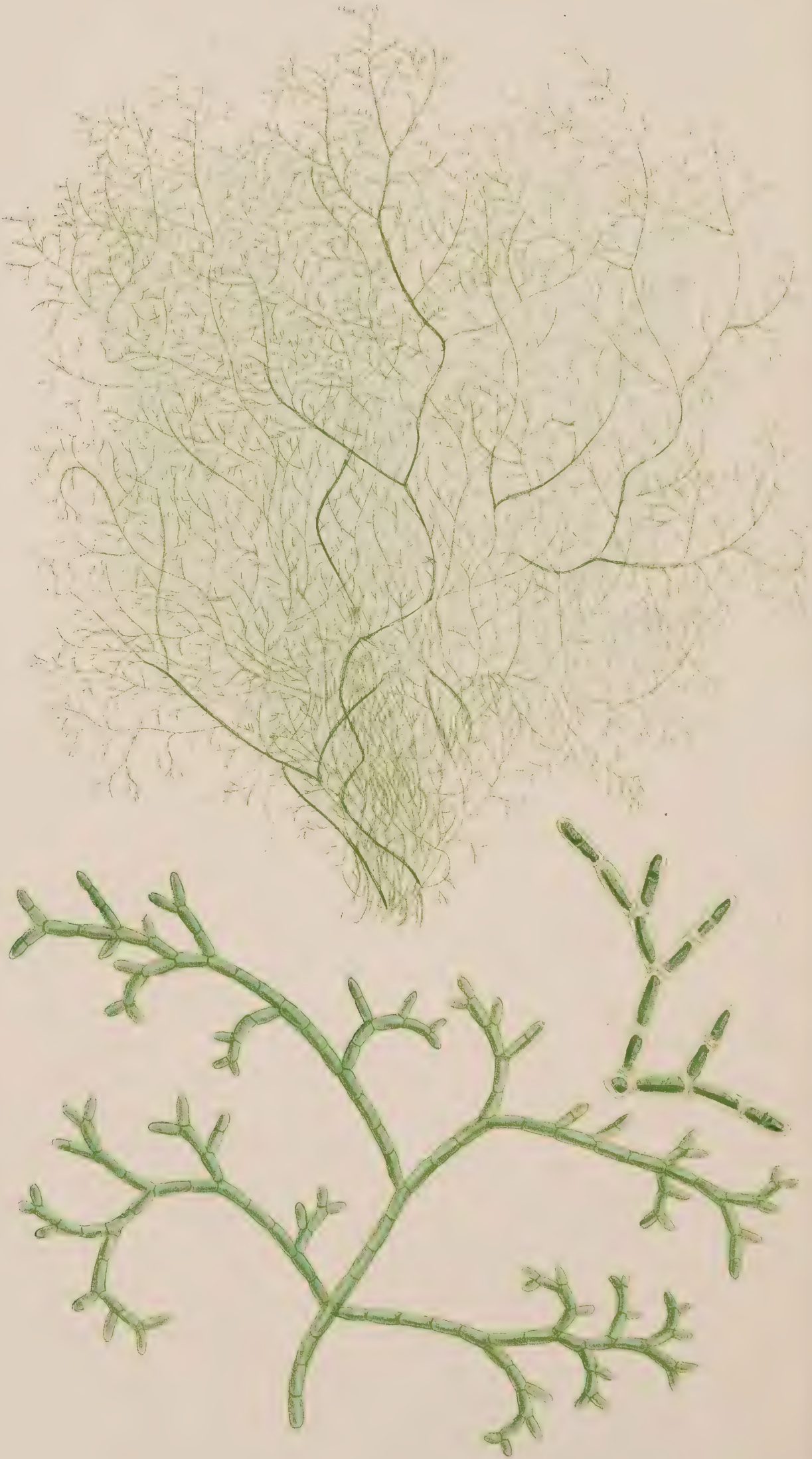
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Fig. 1. *DELESSERIA ANGUSTISSIMA*:—*of the natural size*. 2. Portion of a branch with tetraspores. 3. An axillary ramulus, with the same. 4. Portion of a branch with tubercles. 5. An axillary ramulus containing a tubercle. 6. Portion of a branch with the commencement of a winged margin:—*all magnified*. 7. Fragment of the surface of the frond. 8, 9. Transverse sections of different specimens:—*highly magnified*.

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## PLATE LXXXIV.

CLADOPHORA MACALLANA, *Harv.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*, aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλάδος, *a branch*, and φέρω, *to bear*.

CLADOPHORA *Macallana*; filaments setaceous, rigid, full green, very flexuous, loosely bundled together, excessively branched; branches alternate or rarely opposite, zigzag, very patent; ramuli short, recurved, simple, or pectinated, obtuse; articulations twice or thrice as long as broad; endochrome rather dense.

HAB. On the sandy bottom of the sea, in 4–10 fathom water. Annual. Summer. Dredged in Roundstone Bay, abundantly, *Mr. Mc'Calla*.

GEOGR. DISTR. West of Ireland.

DESCR. *Root* not exactly known. *Filaments* forming crisped subcylindrical bundles from six to twenty inches in length, rigid, bristling (not collapsing) when removed from the water, of a rich, shining, grass-green colour, much branched, and inextricably tangled together, rather brittle. *Branches* very flexuous or bent in a zigzag manner, irregular in length and disposition, sometimes opposite, more usually alternate or secund; sometimes divided in a sub-dichotomous manner, very patent, with wide axils; furnished with a second and third series of smaller branches, and these clothed at short intervals with short ramuli. *Ramuli* alternate or secund, very patent or reflexed, short, cylindrical, obtuse, either simple or more usually pectinated on their upper side with short, one- or two-jointed processes. *Apices* all very blunt. *Endochrome* rather dense, recovering its form, in a degree, when moistened after having been dried. In drying it very imperfectly adheres to paper.

This handsome *Cladophora* was, in 1840, communicated to me by Mr. Mc'Calla, as a new species, but it was not until last summer that I had an opportunity of seeing it in its place of growth, and examining it in a fresh state. At Roundstone, in August, I dredged it in considerable plenty, and convinced myself that it was quite distinct from any described British species; and as I have reason to believe it to be new to botanists, it gives me great pleasure to give it the name of its discoverer, who has well earned such a tribute by the many additions he has made both to the Fauna and Flora of the west of Ireland; and who is now engaged in the preparation of an



excellent work containing dried specimens of Irish Algæ, one volume of which has already appeared.\*

Professor Kützing, who has studied this puzzling genus with much care, and to whom I sent a specimen, writes me that it is quite new to him, and that he considers it to be a good species, allied indeed to *C. alyssoides*, Menegh., "but more rigid, less thick, with longer joints, and a different ramification." Mrs. Griffiths has also expressed a similar opinion.

When growing, it has very much the appearance, at first sight, of *C. rectangularis*, so much so, indeed, that until the ramification be closely looked to, and the *alternate* or *secund* ramuli be observed, it might be mistaken for that species. It grows in the same locality, and occurs in similar loosely-bundled masses, and often accompanies *C. rectangularis* in the same dredge. It possesses the same rigid substance as that species, and the same glossy, bright green colour, except when it is, as most of my specimens are, infected with *Cocconeis aggregata*, which as Dr. Kützing remarks, not only change its colour, but prevent its adhering to paper.

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\* "Algæ Hibernicæ," by William Mc'Calla, Associate of the Edinburgh Botanical Society. S. B. Oldham, Dublin. 1845. Imp. 4to.

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Fig. 1. CLADOPHORA MACALLANA :—*of the natural size*. 2. Part of a filament :—*magnified*. 3. Ramulus :—*more highly magnified*.

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## PLATE LXXXV.

RYTIPHLÆA PINASTROIDES, (*Ag.*)

GEN. CHAR. *Fronde*, filiform or compressed, pinnate, transversely striate, reticulated; the axis articulated, composed of a circle of large, tubular, elongated cells (*siphons*) surrounding a central cell; the periphery of several rows of minute, irregular, coloured cellules. *Fructification* of two kinds, on distinct individuals; 1, ovate *capsules* (*ceramidia*) containing a tuft of pear-shaped spores; 2, *tetraspores*, contained in minute lanceolate *receptacles* (*stichidia*), in a double row. RYTIPHLÆA (*Ag.*)—from *ρυτίς*, a *wrinkle*, and *φλοιός*, the *bark*; because the surface is transversely wrinkled or striate.

RYTIPHLÆA *pinastroides*; frond terete, irregularly branched; lesser branches pectinato-pinnate; the pinnæ secund, with their apices more or less hooked inwards.

RYTIPHLÆA *pinastroides*, *Ag. Syn.* p. 25. *J. Ag. Alg. Medit.* p. 145. *Endl.* 3rd *Suppl.* p. 48.

RHODOMELA *pinastroides*, *Ag. Sp. Alg.* l. p. 381. *Ag. Syst.* p. 200. *Spreng Syst. Veg.* 4. p. 343. *Grev. Alg. Brit.* p. 104. t. 13. *Hook. Br. Fl.* vol. ii. p. 294. *Wyatt, Alg. Danm.* no. 112. *Harv. Man.* p. 68.

HALOPITHYS *pinastroides*, *Kütz. Phyc. Gen.* p. 433. t. 52. f. 2.

GIGARTINA *pinastroides*, *Lyngb. Hyd. Dan.* p. 45.

CERAMIUM *incurvum*, *Dec. Fl. Fran.* vol. ii. p. 33.

FUCUS *pinastroides*, *Gm. Hist. Fuc.* p. 127. t. 11. f. 1. *Good. and Woodw.* in *Linn. Trans.* vol. iii. p. 222. *Turn. Syn.* vol. ii. p. 346. *Turn. Hist.* t. 11. *Stack. Ner. Brit.* p. 74. t. 13. *Eng. Bot. t.* 1042.

FUCUS *incurvus*, *Huds. Fl. Ang.* p. 590. *With.* vol. iv. p. 115.

HAB. On sub-marine rocks, near low-water mark. Perennial. Winter. On the shores of the south of England, in several places. Jersey, *Miss White*, and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea. "Fœroe Islands," *Lyngbye* (very doubtful). New Zealand, *Sir J. Banks*. Ceylon, *Sir J. E. Smith*.

DESCR. *Root* an expanded, disc. *Fronde*s tufted, 4–10 inches in height, cylindrical, about as thick as whip-cord below, much and irregularly branched and bushy, somewhat fastigiate: the main branches alternate or subdichotomous, densely clothed in their lower part with short, subulate, simple, erecto-patent ramuli, which occasionally give a shaggy character to the bases of old fronds; and in their upper, set with elongate, patent or recurved, pectinato-pinnate branches, whose apices are, especially in young fronds, very generally rolled inwards or hooked. These lesser branches are pectinate along their upper side with a double set of subulate ramuli, secundly disposed, generally in pairs, at short intervals, but occasionally somewhat irregularly inserted; all very erect, with straight or hooked apices, and somewhat narrowed at the base.

Both branchlets and ramuli are marked with dark, transverse lines, or spurious articulations, at short intervals, an appearance caused by the articulated, polysiphonous axis of the frond being seen through the subtransparent cells of the periphery. *Fructification*; 1, *ceramidia* ovate, on longish pedicels, borne along the inner faces of the secund ramuli. 2, *Stichidia*, which occupy a similar position on distinct plants, and are shortly stalked, lanceolate, and uncinata. *Tetraspores* triangularly parted. *Substance* cartilaginous and tough; very rigid when dry, and not adhering to paper. *Colour* a dark, dull red, becoming black in dying.

This is one of those plants which, abundant along the shores of southern Europe, reaches its northern limit on the south coast of England; for the report of its having been gathered in the Fœroe Islands, as well as the station "near Dublin," given by Dr. Scott, are, I fear, founded in error. It is assuredly a southern species in its affinities and distribution. We have the high authority of Turner, that it occurs in Ceylon and in New Zealand; otherwise I should have suspected some mistake in these stations also.

The genera *Rytiphlaea*, *Rhodomela* and *Polysiphonia* have so many points of structure in common, and differ by characters of such secondary importance, that it is sometimes a question to which a plant should be referred. The *articulated Polysiphoniæ* indeed, are readily enough distinguished from the species of the two former genera; but it is by an artificial character. For species otherwise closely related, as *P. subulifera* and *P. fruticulosa*, would, were the genus divided on this character, be placed in opposite groups. This would hardly be considered natural. But then it becomes a question how the *inarticulate Polysiphoniæ* are to be separated from the *Rhodomelæ* and *Rytiphlaæ*. Natural habit generally decides it, for there is little structural difference. In the true *Rhodomelæ*, indeed, as *R. subfusca*, and *R. lycopodioides*, the absence of a jointed axis, composed of a circle of elongated cells, affords a ready character. But some of the exotic species have more or less evident traces of such a structure. In *Rytiphlaea*, as here defined, this structure exists; and there is nothing to distinguish the group from the inarticulate *Polysiphoniæ*, except the position of the *tetraspores*, and some difference of habit.

Fig. 1. RYTIPHLÆA PINASTROIDES:—*of the natural size*. 2. A branch with *stichidia*. 3. A *stichidium*. 4. A *tetraspore*. 5. A branch with *ceramidia*. 6. A *ceramidium*. 7. *Spores*, from the same. 8. A longitudinal section of the frond. 9. A transverse semi-section of the same:—*all more or less magnified*.







## PLATE LXXXVI.

CLADOPHORA RUDOLPHIANA, *Kütz.*

GEN. CHAR. *Filaments* green, jointed, attached, uniform, branched. *Fruit*. aggregated granules or zoospores, contained in the joints, having, at some period, a proper ciliary motion. CLADOPHORA (*Kütz.*)—from κλάδος, a branch, and φορέο, to bear.

CLADOPHORA *Rudolphiana*; filaments very long, exceedingly slender, flexuous, subgelatinoso-membranaceous, much branched, brilliant, yellow-green, inextricable; branches, di-trichotomous, or irregular; ultimate ramuli pectinate, secund, very long and much attenuated; articulations of the main filaments many times longer than broad, here and there swollen, their granular endochrome somewhat spiral; those of the ramuli 6–10 times as long as broad.

CLADOPHORA *Rudolphiana*, *Kütz. Phyc. Gen.* p. 268.

CONFERVA *Rudolphiana*, *Ag. in Bot. Zeit.* vol. x. p. 636. *J. Ag. Alg. Medit.* p. 12.

CONFERVA *Kaneana*, *Mc'Calla. Alg. Hib.* no. 29.

HAB. Parasitical on *Zostera*, the various *Laminariæ* and other sea plants, in 2–6 fathom water. Annual. Summer. Very abundant in Roundstone Bay, Cunnemara, *Mr. Mc'Calla.* Falmouth, *Miss Warren.*

GEOGR. DISTR. Adriatic Sea, *Agardh!* (v. in *Herb. Hook.*)

DESCR. *Filaments* exceedingly slender, forming very flaccid, subgelatinous tufts from six to twenty inches in length, excessively branched, and in most cases inextricably entangled. The branching appears to be an irregular combination of dichotomous, and alternate, with here and there some opposite branches; and all the main divisions are either very flexuous or angularly bent. The ultimate ramuli are very long, attenuated to a fine point, and disposed in secund, subpectinate groups. Frequently one of the joints swells into an elliptical or spindle form, but without much apparent alteration in its nature. All the joints are of great length, as compared with their diameter, those of the main filaments being upwards of ten times longer than broad; those of the ramuli from six to ten times. Their endochrome is lax, pellucid, and its granules are attached in subspiral lines to the walls of the cells. The colour is a rich glossy green; the substance very soft; and the whole plant adheres closely to paper in drying, and preserves its colour.

One of the commonest sea plants in Roundstone Bay, Cunnemara, where it infects every object on which it can lay hold, at a depth of from two to six fathoms, or perhaps more. It is very frequently found on the *Laminariæ*, on *Zosteræ*, &c. Whilst young, and freely waving in the water, it is a very beautiful



object; but in age its tufts become drawn out to a great length, and its filaments twisted into green, mucous ropes, which stick to any object which comes near them. The botanist who dredges where this plant grows, however much he may admire it on the first few hauls, will soon wish that it was not quite so affectionate.

In this country it was first noticed by Mr. Mc'Calla, who, observing that it was different from any British species, and believing it to be new, published specimens in his '*Algæ Hibernicæ*,' under the name *Conferva Kaneana*, dedicating the species to Lady Kane, authoress of '*The Irish Flora*,' who happened to be in the boat when the plant was discovered. I should have adopted this name had I not found, in Sir W. J. Hooker's rich Herbarium, a specimen of the *C. Rudolphiana*, of Agardh, communicated by that author, which agrees in all essential particulars with our Irish plant; as does also the short description given by Agardh, in the '*Bot. Zeitung*.'\* Professor Kützing, however, informs me that what he has received under the name *C. Rudolphiana*, from Biassoletto, is a different plant, and that Agardh has distributed several different species under this name. This may possibly be so, yet I can hardly set aside the authority of the original specimen above mentioned; supported by the character—a very unusual one—of the occasional swelling of the joints, which I observed before I had seen Agardh's, *C. Rudolphiana*, or was aware what character he had assigned to it.

Among British species, the nearest affinity of *C. Rudolphiana*, is with *C. gracilis*, with which it agrees in the ramification, and in the great length of the alternate ramuli. But its filaments are very much more slender, its substance softer, and more flaccid, and its joints very much longer. The *great* length of the joints will also distinguish it from *C. albida*, which it likewise resembles.

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\* *C. Rudolphiana*; filis di-trichotomis ramosissimis attenuatis mucosis, articulis diametrum pluries superantibus, hic illic in globos ellipticos inflatis. *Ag.* in *Bot. Zeit.* vol. x. p. 636.

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Fig. 1. CLADAPHORA RUDOLPHIANA:—*of the natural size.* 2. A portion of a branch. 3. A joint from the filaments. 4. One of the swollen joints:—*all more or less magnified.*

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PLATE LXXXVII.

SPHACELARIA PLUMOSA, *Lyngb.*

GEN. CHAR. *Filaments* jointed, rigid, distichously branched, pinnated; rarely simple, or subdichotomous. *Apices* of the branches distended, membranous, containing a dark, granular mass. *Fructification*; elliptical *utricles*, furnished with a limbus, borne on the ramuli. SPHACELARIA (*Lyngb.*),—from σφάκελος, *gangrene*, alluding to the withered tips of the branches.

SPHACELARIA *plumosa*: filaments naked at the base, elongated, irregularly branched, inarticulate; branches pectinato-pinnate; pinnæ opposite, simple, very long and closely set.

SPHACELARIA *plumosa*, *Lyngb. Fl. Dan.* p. 103. t. 30. *Ag. Syst. Alg.* p. 166. *Ag. Sp. Alg.* vol. ii. p. 24. *Grev. Fl. Edin.* p. 313. *Harv. in Hook. Brit. Fl.* vol. ii. p. 324. *Harv. in Mack. Fl. Hib.* part iii. p. 180. *Harv. Man.* p. 38. *Wyatt, Alg. Danm.* no. 300. *Endl. 3rd Suppl.* p. 23.

CHÆTOPTERIS *plumosus*, *Kütz. Phyc. Gen.* p. 293.

CERAMIUM *pennatum*, *Fl. Dan.* t. 1481. *Roth. Cat. Bot.* vol. iii. p. 133. *Ag. Syn.* p. 68.

CONFERVA *pennata*, *Sm. E. Bot.* t. 2330 (*the left hand figure*).

HAB. On rocks, near low-water mark, and at a greater depth. Perennial. Beachy Head, *Mr. Borrer*. Frith of Forth, *Sir J. Richardson and Dr. Greville*. Wicklow, *W. H. H.* Belfast Bay, *Mr. W. Thompson*. Near Caernarvon, also at Ilfracombe, and Land's end, *Mr. Ralfs*. Howth and Balbriggan, *Miss Gower*. Orkney, *Rev. J. H. Pollexfen*. Kilbride, *Major Martin*.

GEOGR. DISTR. German Ocean, along the shores of Denmark and Norway. Baltic Sea. Greenland, *Fabricius* (*see Lyngb.*).

DESCR. *Root* minute, scutate. *Fronde*s tufted, from two to four or six inches in length, setaceous, naked below, irregularly much branched above. *Branches* alternate or secund, or frequently fasciculate, several growing from the wounded apex of an older branch, one or two inches long, simple, erectopatent, closely pectinate throughout their whole length with slender articulated ramuli. *Ramuli* patent, from one to three lines in length, opposite, issuing from every joint of the branches, parallel to each other, and of equal length, either quite simple or occasionally pectinato-pinnate in their upper half. *Apices* of the branches frequently sphacelate. *Main stem* opaque, not obviously jointed; branches more translucent, jointed, the joints shorter than their breadth, longitudinally striate, and marked with a dark-coloured spot; joints of the ramuli about once and a half as long as broad, similarly marked. *Colour* olivaceous, or occasionally rusty. *Substance* rigid, not adhering to paper in drying.

By earlier writers this beautiful species was confounded with



*S. cirrhosa*, of which it was considered to be a luxuriant variety, and in 'English Botany' both are represented on the same plate. Mr. Borrer was, I believe, its first detector in this country, and I am indebted to him for one of the original specimens, gathered at Beachy head. From *S. cirrhosa* it may always be known, by the different structure of the stem, the closer and more regularly pectinated ramuli, and the greater size.

*S. plumosa* appears to be peculiarly a northern plant, for though first observed on the south coast of England, it is by no means common there, nor are the specimens more than half the size of that represented in our plate. Further north, it is much more frequently met with, and becomes much more luxuriant. Our figure is taken from a Welsh specimen, and those collected by Sir. J. Richardson, at Colvend, in Dumfriesshire, are still more beautifully feathered with long ramuli. The Continental stations are all, it will be observed, from the north of Europe. I am not aware of its being found on the French coast.

In substance and general habit, *S. plumosa* has very much the appearance of a *Sertularia*, and is almost as rigid. By Professor Kützing it is made the type of a separate genus, on account of the structure of its stem being a little different from that of the typical species; but the difference does not appear to me to be sufficiently great to warrant the dismemberment of so natural a group, unless it were further borne out by a difference in fructification. But the fructification of this, as well as of several others of the *Sphacelariæ*, is unknown.

*Fucus rudis* of Esper (Ic. Fuc. t. 27), which is said to be a native of the shores of England and France, is referred by Lyngbye to *Sphacelaria plumosa*, but if intended for this plant it is indeed a very *rude* representation of it. Esper's figure much more nearly resembles a faded piece of *Ballia Brunonis*, a native of the Southern Ocean; but is said to have been drawn from a specimen received from Normandy.

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Fig. 1. SPHACELARIA PLUMOSA :—of the natural size. 2. Segment of a branch.  
3. Portion of one of the pectinate ramuli. 4. A cross section of the stem:  
—all more or less highly magnified.

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## PLATE LXXXVIII.

CATENELLA OPUNTIA, *Grev.*

GEN. CHAR. *Fronde* dull-purple, membranaceous, filiform, constricted at intervals; its axis composed of a lax net-work of anastomosing, longitudinal filaments; its periphery of densely compacted, dichotomous, moniliform filaments. *Fructification* of two kinds, on distinct individuals; 1, spherical masses of *spores* (*favellidia*), contained in external capsular bodies (abortive ramuli, resembling *ceramidia*); 2, solitary oblong, transversely parted *tetraspores*, surrounded with a limbus, and formed from the filaments of the periphery, in which they are immersed. CATENELLA (*Grev.*),—*a little chain*, “in allusion to the chain, or necklace-like form of the frond.”

CATENELLA *opuntia*; fronds rising from a mass of creeping fibres, vaguely branched; pseudo-articulations lanceolate or elliptical, about four times as long as broad.

CATENELLA *opuntia*, *Grev. Alg. Brit.* p. 166. t. 17. *Hook. Br. Fl.* vol. ii. p. 309. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 51. *Wyatt, Alg. Danm.* no. 126. *J. Ag. Alg. Medit.* p. 89. *Endl. 3rd Suppl.* p. 37. *Kütz. Phyc. Gen.* p. 394. t. 76. f. 4.

CHORDARIA *opuntia*, *Spreng. Syst. Veg.* vol. iv. p. 330.

LOMENTARIA *opuntia*, *Gaill. Dict. Hist. Nat.* v. 53. p. 367.

HALYMENIA? *opuntia*, *Ag. Sp. Alg.* vol. i. p. 217. *Syst.* p. 245.

CHONDRIA *opuntia*, *Hook. Fl. Scot.* part 2. p. 106. *Grev. Fl. Edin.* p. 292.

GIGARTINA *opuntia*, *Lamour. Ess.* p. 49.

GIGARTINA *pilosa*, *Lamour. l. c.* p. 49 (*see Ag.*).

RIVULARIA *opuntia*, *Gm. Eng. Bot.* t. 1868.

FUCUS *opuntia*, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 219. *Stack. Ner. Brit.* p. 104. t. 16. *Turn. Syn. Fuc.* vol. ii. p. 387. *Turn. Hist.* t. 107.

FUCUS *repens*, *Lightf. Fl. Scot.* vol. ii. p. 961. *With.* vol. iv. p. 91.

FUCUS *cæspitosus*, *Stack. Ner. Brit.* p. 59. t. 12.

ULVA *articulata* β. *Huds. Fl. Angl.* p. 569.

HAB. On submarine rocks, piles, &c., near high-water mark. Perennial. Not uncommon on the shores of England, Ireland, Scotland, and the Orkney Islands. Rarely found in fruit.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea. New Zealand, *Dr. Hooker*.

DESCR. *Root*, a mass of creeping, irregularly branched fibres. *Fronde*s springing from the creeping fibres, erect, densely tufted, and forming patches two or more inches in diameter, spreading over any substance which they encounter, half an inch to nearly an inch in height, sparingly branched, constricted at intervals into a string of oblong or lanceolate pseudo-articulations. *Branches* similar to the main stem, alternate or opposite, simple or forked, their terminal joints acute. *Substance* membranaceous. *Structure*; the

central portion of the frond is filled with a watery mucus, through which run longitudinal jointed fibres, with a narrow, coloured endochrome and a wide pellucid limbus, anastomosing together into a lax net-work, with large, oblong, subhexagonal meshes; these constitute the axis: the periphery or outer wall of the frond is formed of very delicate, closely packed, horizontal dichotomous, moniliform filaments, which spring from the most exterior of the fibres of the net-work, and their apices, closely glued together, unite into the membranous coat of the frond. *Fructification*; 1. spherical masses of spores or *favellidia* contained in ovate capsules, furnished with a terminal pore, their walls formed of moniliform filaments. The mass of spores appears to be formed by a transformation of the internal net-work. 2. Oblong *tetraspores* divided at maturity by three transverse lines, formed from the filaments of the periphery, and scattered at intervals among them. *Colour* a dull purple.

This curious little plant appears to have been first noticed by Dillenius, in whose Herbarium specimens are preserved, according to Mr. Turner; and was next excellently described by Lightfoot, who remarks that its branches resemble "the jointed leaves of the *Cactus opuntia*," a resemblance which has suggested the specific name, by which it has since been universally distinguished. Lightfoot's trivial name "*repens*" has, however, the priority: though no one has adopted it.

Its generic relations were, as appears by the numerous synonyms, long imperfectly understood, and few Algæ have been more tossed about from one group to another, until, in 1830, Dr. Greville proposed it as the type of a new genus, in which step he has since been gladly followed by every succeeding author. His judgment was formed solely from consideration of the structure of the frond; the fructification being unknown to him. The *tetraspores* were first described, so far as I am aware, by Prof. J. Agardh, in his '*Algæ Mediterraneæ*,' his specimens having been received from Professor Meneghini, and they have been excellently figured by Kützing, in his great work. In this country both kinds of fruit were discovered by Mrs. Griffiths, to whose kindness I am indebted for all the specimens I have seen.

*C. opuntia* can only be confounded with a dwarf state of *Chylocladia articulata*, which is about the same size. But, not to speak of difference of structure, the brighter colour, cylindrical joints, delicate substance, acute angles, and forked fronds of the latter, sufficiently distinguish it.

Fig. 1. CATENELLA OPUNTIA :—*of the natural size*. 2. Fronds. 3. A joint bearing a *ceramidium*. 4. *Ceramidium* cut open. 5. Spores, from the same. 6. Longitudinal section of the frond. 7. Transverse semi-section, with tetraspores *in situ*. 8. A tetraspore :—*all more or less highly magnified*.









## PLATE LXXXIX.

PYCNOPHYCUS TUBERCULATUS, *Kütz.*

GEN. CHAR. *Root* composed of branching fibres. *Fron*d cylindrical, dichotomous. *Air-vessels*, when present, innate, simple. *Receptacles* terminal, cellular, pierced by numerous pores, which communicate with immersed, spherical *conceptacles*, containing, in the lower part of the receptacles, parietal, simple *spores*, and in the upper, tufted *antheridia*. PYCNOPHYCUS (*Kütz.*),—from *πυκνός*, *thick*, and *φῦκος*, a *sea-weed*.

PYCNOPHYCUS *tuberculatus*.

PYCNOPHYCUS *tuberculatus*, *Kütz. Phyc. Gen.* p. 359 (1843).

CYMA DUSE *tuberculata*, *Dne. Ann. Sc. Nat.*, 1845. p. 12.

FUCUS *tuberculatus*, *Huds. Fl. Ang.* p. 588: *Good. and Woodw. in Linn. Trans.* vol. iii. 198. *Turn. Syn. Fuc.* vol. ii. p. 505. *Turn. Hist.* t. 7. *Esper, Ic. Fuc.* vol. ii. p. 20. t. 121. *E. Bot.* t. 726. *Lamour. Ess.* p. 20. *Stack. Ner. Brit.* append. *Ag. Sp. Alg.* vol. i. p. 98. *Ag. Syst.* p. 279. *Spreng. Syst. Veg.* vol. iv. p. 316. *Grev. Alg. Brit.* p. 18. *Hook. Br. Fl.* vol. ii. p. 269. *Harv. in Mack. Fl. Hib.* part 3. p. 169. *Harv. Man.* p. 21. *Wyatt, Alg. Danm.* no. 103. *Endl. 3rd Suppl.* p. 29.

FUCUS *bifurcatus*, *With.* vol. iv. p. 109. t. 17. f. 1.

HAB. In rock-pools left, on the recess of the tide, near low-water mark; never growing in places which are dry at low-water. Perennial. Summer and autumn. Several places on the coast of Cornwall, *Hudson, Stackhouse, Turner, &c.* Ilfracombe, *Bishop Goodenough.* Bill of Portland, *Mr. Bryer.* North of Ireland, *Dr. Scott* (sec *Turn.*). Abundant on the west coast of Ireland, in several places, from Galway to Cork. Jersey, *Miss White* and *Miss Turner.*

GEOGR. DISTR. Atlantic shores of France and Spain. Coast of Barbary, *Web.* and *Mohr.* Cape of Good Hope, *Bowie* and *W. H. H.*

DESCR. *Root*, formed of branching fibres, which extend in patches from one to several feet in diameter, over the surface of the rock. *Fron*ds 12–20 inches long, as thick as a goose-quill, cylindrical, erect, quite simple for the distance of from four to eight inches from the root, then forked; and afterwards repeatedly, but irregularly, dichotomous, one of the arms of the fork being longer and stronger than the other, so that eventually the frond often appears as if alternately branched. *Axils* obtuse, rounded. *Vesicles* frequently absent; when present, generally innate in the ultimate branches, or immediately below one of the upper forkings. *Receptacles* terminating the branches, from a prolongation of which they are formed, simple, cylindrical, obtuse, composed internally of compact cellular tissue; the cells polygonal. They are, when ripe, tuberculated, each tubercle pierced by a pore, beneath which is placed a spherical *conceptacle*. In the lower part of the receptacle, the conceptacles contain numerous parietal, simple, elliptical spores, narrowed at their lower end; in the upper part, they are destitute of spores, but filled with tufts of branching filaments, to which *antheridia* are attached. *Colour*, when growing, a clear olive, more yellow, and semi-

transparent in the receptacles; when dry, black. *Substance* tough, between coriaceous and cartilaginous; brittle when dry.

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There is something so peculiar in the habit of this species, so different from that of the other members of the restricted genus *Fucus*, that it seems, even at first sight, to have claims to be regarded as belonging to another genus. Its branching root, and cylindrical frond are very obvious distinctions, but they are not the only ones. When we come to examine its receptacles more closely, we find, that not merely are they (so to speak) *monœcious*, each receptacle containing the two kinds of conceptacles, while in *Fucus* they are *diœcious*; but, their cellular structure is widely different, those of the present individuals agreeing much more nearly with the receptacles of *Halidrys*, than of *Fucus proper*. And it is next to *Halidrys* that Kützing has placed it in his arrangement; and in my opinion, very properly.

There is also a striking affinity between the present genus and *Xiphophora*, Mont., and a nearer analogy, as it appears to me, than with *Himanthalia*, with which the learned founder of the former has ably contrasted it. In *Xiphophora* as in *Pycnophycus*, we have the terminal segments of a dichotomous frond converted into receptacles, which receptacles are in both cases monœcious; and the most striking difference between the genera is, that in *Pycnophycus* there is an obvious line of demarcation between the frond and the receptacle, while in *Xiphophora* the receptacles are confluent with the upper branches. Possibly *Fucus confluens*, Br., may have a similar structure in essential points.

This plant has a wide range, being found at the Cape of Good Hope, as well as on the shores of southern Europe and of North Africa. In the British Islands, it is much more common in Ireland than in England, being abundant along our western coasts, at least as far north as Galway. Whereabouts in "the north of Ireland" Dr. Scott met with it, we are not told, but no one has found it recently on the shores of Ulster.

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Fig. 1. PYCNOPHYCUS TUBERCULATUS:—*of the natural size*. 2. A spore. 3. Cross section of a segment of a receptacle, showing a conceptacle cut open, containing parietal spores.

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*Handwritten text, possibly a title or description, in a cursive script.*



## PLATE XC.

CERAMIUM NODOSUM, *Griff. and Harv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification*, of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κέραμος*, a *pitcher*, but the fruit is *not* pitcher-shaped.

CERAMIUM *nodosum*; frond capillary, of equal diameter throughout, rigid, dichotomous, excessively divided, fastigiate; the axils very patent; articulations pellucid, those of the middle of the stem from four to six times as long as broad, the upper gradually shorter; dissepiments swollen; tetraspores erumpent, two or three together on the outer edge of short, accessory ramuli; favellæ at the apex of accessory ramuli.

HORMOCERAS *nodosum*, *Kütz. in Linnæa*, vol. xv (1841). p. 732. *Kütz. Phyc. Gen.* p. 378. t. 45. f. 1–7 (*showing the germination of a spore*).

CERAMIUM *diaphanum*, rigid variety, *Wyatt, Alg. Danm.* no. 217.

CERAMIUM *rigidulum*, *Griff. and Harv. in Herb.*

CERAMIUM, new species, *Mc'Calla, Alg. Hib.* vol. i. no. 43.

HAB. On sandy shores, often at the roots of *Zostera*. Meadfoot, near Torquay, *Mrs. Griffiths*. Isle of Wight, *Miss Kirkpatrick*. Dublin Bay and Ireland's Eye (1838), *Miss Ball*. Bangor (1835) and Newcastle, Co. Down, *Mr. W. Thompson*. Howth, *Miss Gower*. Rathmullar, *Mrs. Ovens*. Roundstone Bay, *Mr. Mc'Calla*.

GEOGR. DISTR. Mediterranean Sea, *Kütz. in* New York, *Professor Bailey*. Tasmania, *Ronald Gunn, Esq.*

DESCR. *Fronds* springing many from the same base, and forming dense globular tufts, from three to six inches in diameter. *Filaments* very slender, finer than human hair, excessively branched from the base in a more or less regularly dichotomous manner, preserving an equal diameter throughout their length; more or less furnished in the upper part, especially in fertile specimens, with short ramuli. *Axils* in all parts of the frond, very patent, sometimes divaricating. *Apices* nooked inwards. *Articulations* colourless, five or six times as long as broad in the lower and middle branches, thrice as long as broad in the upper; and gradually diminishing in length towards the apex. *Dissepiments* smooth (without prickles), globose, swollen, coated with a stratum of minute brownish-red cellules. *Tetraspores* formed in the dissepiments of short, lateral ramuli, roundish, with a wide border. *Colour* of the tufts, brownish-red. *Substance* rigid and harsh to the touch when recent; soon becoming flaccid. It adheres, but not very strongly, to paper in drying.



The species of the genus *Ceramium*, unless, with earlier writers, we reduce the multiplied forms presented to the eye to three or four *types*, are not only very numerous, and very widely dispersed, but are so closely connected together by doubtful looking varieties, that their study and disentanglement becomes a task of much difficulty. Until of late years British authors have been contented to recognise but three, *C. rubrum*, *C. diaphanum* and *C. ciliatum*; to which, in the 'Manual', I ventured to add two others. But now, since Kützing has published, though with less perfect materials to work upon than exist in British Herbaria, no less than forty-two which he divides into six genera (!); the attention of British botanists has been aroused, and many new *Ceramia* added to our list.

Among these is the subject of the present plate, which having been published in two collections of dried specimens, is pretty generally known to British botanists, though perhaps not under the name here given. I believe it was first detected by Mrs. Griffiths, from whom I received specimens several years ago, and by her has always been regarded as a well marked species, distinguished from those most nearly allied to it, by a certain harshness to the touch, or rigidity, as well as by its very patent forking. In these respects it differs from *C. fastigiatum*, which it most nearly resembles.

Of the synonyme of Kützing, I feel confident, having submitted a specimen to that author; but by him *C. nodosum* is placed in his genus *Hormoceras*, the character of which is to have immersed tetraspores, whereas, I find these to be erumpent, a character which would place it in *Gongroceras*, Kütz. Possibly Kützing's specimens had not mature fruit.

Occasionally, tufted, root-like fibres issue from the swollen joints, as I find on Miss Ball's and Miss Gower's specimens.

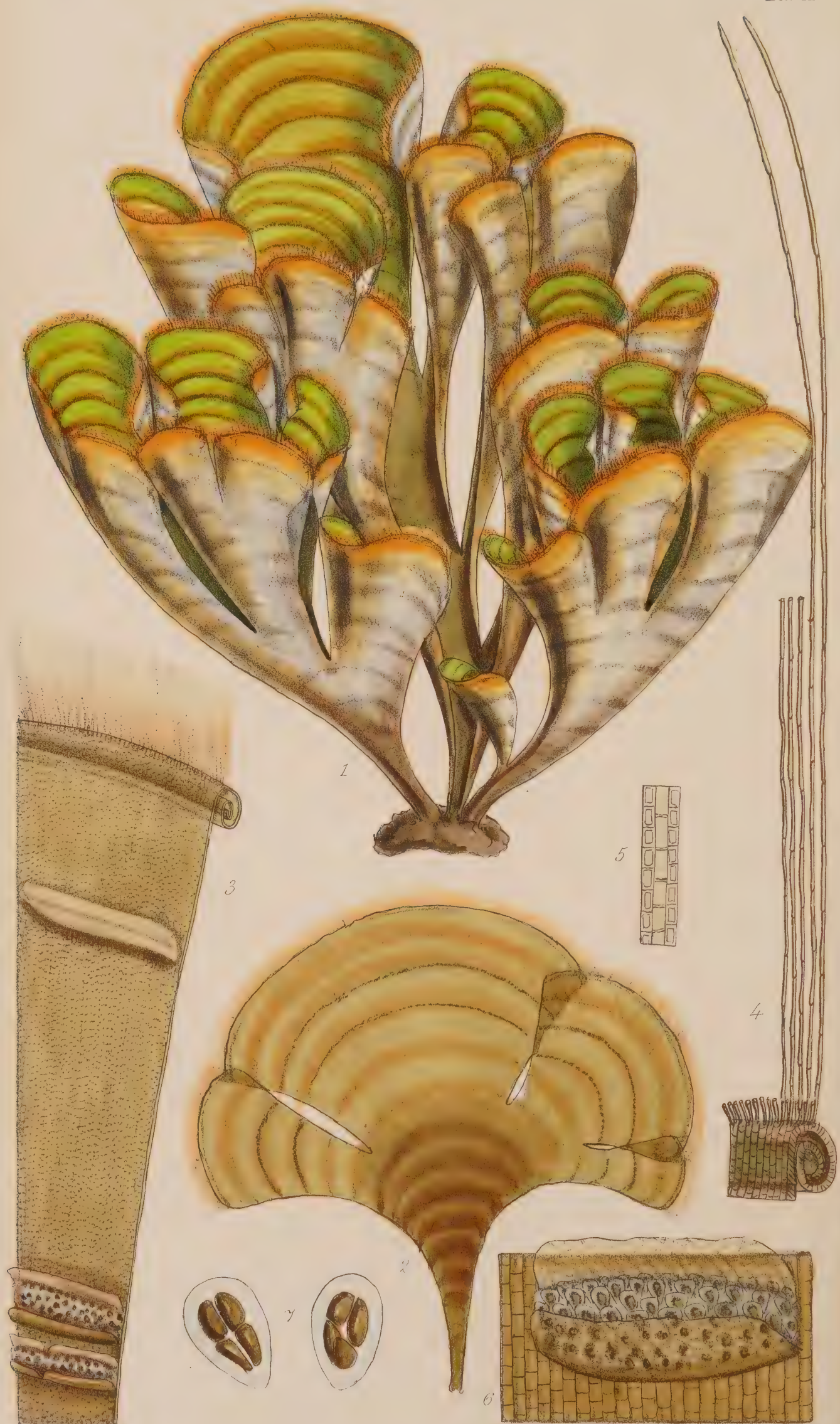
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Fig. 1. CERAMIUM NODOSUM:—*of the natural size*. 2. Upper portion of a filament. 3. Portion of a fertile frond, with *favellæ*. 4. Portion of a fertile frond with *tetraspores*:—*all more or less highly magnified*.

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## PLATE XCI.

PADINA PAVONIA, *Lamour.*

GEN. CHAR. *Root* coated with woolly fibres. *Fron*d flat, ribless, fan-shaped, marked at regular distances with concentric lines, fringed with articulated filaments; apex involute. *Fructification*, linear, concentric sori, bursting through the epidermis of the frond, containing at maturity, numerous obovate utricles or tetraspores, fixed by their base, and containing four sporules. PADINA—a name invented by Adanson, who has not explained the meaning.

PADINA *Pavonia*; frond between membranaceous and coriaceous, broadly fan-shaped, entire or deeply cleft, powdery on its outer surface; concentric lines numerous.

PADINA *Pavonia*, *Lamour. Dict. Class. d'Hist. Nat.* vol. 12. p. 589. *Gaill. Dict. Hist. Nat.* vol. 53. p. 371. *Grev. Alg. Brit.* p. 62. t. x. *Hook. Br. Fl.* vol. ii. p. 281. *Harv. Man.* p. 30. *Wyatt, Alg. Danm.* no. 11. *J. Ag. Alg. Medit.* p. 39. *Endl. 3rd Suppl.* p. 25. *Menegh. Alg. Ital. and Dalm.* p. 239. *Montg. Hist. Cuba*, p. 67. *Cell. Canar.* p. 145. *Alger.* p. 33.

PADINA *Mediterranea*, *Bory, Morée*, p. 75. *Montag. Crypt. Alg.* n. 79.

DICTYOTA *Pavonia*, *Lamour. Ess.* p. 57.

ZONARIA *Pavonia*, *Ag. Sp. Alg.* vol. i. p. 125. *Ag. Syst.* p. 263. *Spreng. Syst. Veg.* vol. iv. p. 326. *Kütz. Phyc. Gen.* p. 341. t. 22. f. 1.

ULVA *Pavonia*, *Linn. Syst. Nat.* p. 719. *Esper. App.* t. 4. *E. Bot.* t. 1276. *Derf. Fl. Atlant.* vol. ii. p. 428. *Roth. Cat.* vol. ii. p. 240. vol. iii. p. 322.

ULVA *cucullata*, *Cav. Ic.* vol. ii. p. 73. t. 191. f. 2. E.

FUCUS *Pavonius*, *Linn. Sp. Pl.* vol. ii. p. 1630. *Wulf. Crypt. Alg.* p. 33.

HAB. On rocks in shallow pools, at half-tide level. Annual. Summer and autumn. Several places along the southern coasts of England; abundant at Torquay. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Very abundant in the Mediterranean. Tropical, Atlantic, and Indian Oceans.

DESCR. *Root*, an expansion, densely coated and cushioned with woolly filaments. *Fron*ds tufted, two to five inches in height, cuneate and attenuate at the base, broadly fan-shaped upwards, simple, or cleft from the summit into several lobes, which as they increase in size, gradually acquire a fan-shaped outline, the apical margin being circularly curved. The whole frond of young plants, and the several lobes of those further advanced, are, when growing, curled round into funnel-shaped cups. At distances of one to two lines the frond is marked with concentric bands, along each of which a fringe of orange-coloured articulated filaments, of extreme tenuity, and about two lines in length, extends. These, which originally have clothed every band or zone, are seldom found perfect, except on the two or three uppermost, and on the marginal one; falling away as the frond advances. The margin at the summit of the frond is strongly rolled inwards; the outer or lower surface, is covered, more or less perfectly, with a white, chalky powder; the inner, except for the fringes of filaments, is smooth, and of a yellowish olive, reddish towards the base, and greenish toward the apex. *Substance* thickish, subcoriaceous below, delicately membranous

above, highly reticulated. *Fructification*, linear lines of dark coloured spores, formed beneath the epidermis, along the concentric zones, at length bursting through the coating of the frond, which forms a permanent indusium to them. At maturity the spores contain four sporules.

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A very remarkable plant, abundant in the Tropical Ocean, and reaching its northern limit on the southern shores of England, without exhibiting any depauperation from climate. The British specimens are fully as large as those from warmer latitudes, and as well coloured. This being the case, one would naturally expect that it may yet be discovered further north. There is indeed a tradition, resting on the authority of Dr. Cargill, quoted by Lightfoot, that it was once gathered at Aberdeen, but it has not been found in Scotland in modern times, and I fear there has been a mistake: yet it is difficult to imagine what could have been mistaken for it, so different in appearance is it from all other Algæ.

Probably this is the only genuine species of the genus, as now restricted; the tropical forms which have been described being mere varieties of this type. Our British *P. parvula* must be separated, and has been made the type of a peculiar genus by Areschoug; while *P. deusta*, Hook., now constitutes the genus *Ralfsia*. Several of the Grevillian species, which differ considerably in their fructification from *P. Pavonia*, now form the restricted genus *Zonaria*, J. Ag.; a very natural group, but not very happily named, for they are much less regularly zoned than the *Padina*.

So singular a species as this is could not fail to be observed at an early period, and notices of it occur in Bauhin, and other early writers. An excellent account is given by Ellis, accompanied by a figure with very correct dissections, in his celebrated work on Corallines, into which he has introduced it, not on the supposition of its animal nature, but from the elegance of its form, and singularity. Its general resemblance to the expanded tail of the Peacock, has been noticed by all authors. When viewed growing under water this resemblance is peculiarly striking, the fringes of capillary fibres which adorn it, decomposing the rays of light, and giving rainbow colours to the surface.

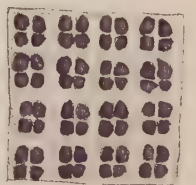
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Fig. 1. Tuft of *PADINA PAVONIA*. 2. A frond separated and expanded:—*both of the natural size*. 3. Segment of the frond, showing involute apex; capillary fringe; and young and old sori. 4. Apex and fringe. 5. Vertical section. 6. Portion of a sorus. 7. Tetraspores:—*all more or less highly magnified*.

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## PLATE XCII.

PORPHYRA LACINIATA, *Ag.*

GEN. CHAR. *Frond* delicately membranaceous, flat, purple. *Fructification*, granules, arranged in fours, scattered over the whole frond; also “scattered sori of oval spores.” (*Ag.*, *Grev.*). PORPHYRA (*Ag.*).—from πορφύρος, purple.

PORPHYRA *laciniata*; frond deeply and irregularly cleft into several broad segments.

PORPHYRA *laciniata*, *Ag. Syst.* p. 190. *Ag. Ic. Alg. Eur.* t. 26, 27. *Grev. Alg. Brit.* p. 168. *Hook. Br. Fl.* vol. ii. p. 310. *Harv. in Mack. Fl. Hib.* part 3. p. 241. *Harv. Man.* p. 169. *Wyatt, Alg. Danm.* no. 32. *Endl. 3rd Suppl.* p. 19. *Kütz. Phyc. Gen.* p. 383.

PORPHYRA *umbilicalis*, *Kütz. Phyc. Gen.* p. 383.

ULVA *laciniata*, *Lightf. Fl. Scot.* p. 974. t. 33. *Roth, Fl. Germ.* p. 585. *Ag. Sp. Alg.* vol. i. p. 404.

ULVA *umbilicalis*, *E. Bot.* t. 2286. *Lyngb. Hyd. Dan.* p. 28.

HAB. On marine rocks, within the range of the tide. Annual. Spring to autumn. Abundant on all our shores.

GEOGR. DISTR. Throughout the Atlantic Ocean, from the Fœroe Islands to the Cape of Good Hope.

DESCR. *Root*, a minute disc. *Fronde*s two to eight inches long, clustered together, expanded, delicately membranaceous, pellucid, very irregularly divided into several lobes; the point of attachment frequently within the frond, which is then peltate. *Margin* wavy, entire or irregularly cut; apices often truncate. Under the microscope the whole frond appears to be divided into squares, in the manner of a tessellated pavement, and within each square are four purple granules, or spores, which constitute the fructification and the whole colouring matter of the frond. When not in a state of perfect fructification the colour is much less bright, tending to a livid olive. Besides the usual fructification, Dr. Greville describes a second, consisting of “sori of smaller ovate granules scattered without order chiefly towards the margins of the frond.” These I am not acquainted with. In drying, the colour becomes much brighter; but the glossy and delicate fronds do not adhere closely to paper, and shrink very much.

This very common plant is found in most parts of the Ocean throughout the tropics, and exists nearly as far as vegetation extends towards the poles. It varies in different places, something in substance, being thicker or thinner; something in colour, being sometimes of a bright purple, and sometimes much tinged with olivaceous green; and something in form, some indi-

viduals having a flat lobed frond, and others a cup-shaped frond fixed by a central point. But all its forms are easily recognized, and may be traced by insensible gradations, one into the other.

The genus *Porphyra* is anomalous among the *Chlorosperms*, having the colour of the more perfectly organized *Rhodosperms*. From these latter it differs in its diffused fructification, and in this respect perfectly agrees with the *Ulvaceæ*, among which it is placed.

This species, together with the closely allied *P. vulgaris*, is sometimes brought to table in England under the name of *Laver*; and in Scotland and Ireland under that of *Sloke*, *Slouk*, or *Sloukawn*. After many hours boiling the frond is reduced to a somewhat slimy pulp, of a dark brown colour, which is eaten with pepper and lemon-juice or vinegar, and has an agreeable flavour to those who have once conquered the repugnance to taste it, which its great ugliness induces, and many persons are very fond of it. It might become a valuable article of diet, in the absence of other vegetables, to the crews of our whaling vessels cruising in high latitudes, where every marine rock, at half-tide, abundantly produces it. In its prepared state it may be preserved for an indefinite time in closed tin-vessels.

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Fig. 1. PORPHYRA LACINIATA :—*of the natural size*. 2. Small portion of the frond, showing the quaternate granules :—*magnified*.

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## PLATE XCIII.

CODIUM TOMENTOSUM, *Stack.*

GEN. CHAR. *Frond* green, sponge-like (globular, cylindrical or flat; simple or branched), composed of tubular, interwoven, inarticulate filaments (elongated, branching cells). *Fructification*; opaque vesicles (*coniocystæ*) attached to the filaments. CODIUM (*Stack.*),—from κῶδιον, *the skin of an animal*.

CODIUM *tomentosum*; frond linear, dichotomous, cylindrical or compressed.

CODIUM *tomentosum*, *Stack.* *Ag. Sp. Alg.* vol. i. p. 452, *Ag. Syst.* p. 177. *Spreng. Syst. Veg.* vol. iv. p. 365. *Grev. Alg. Brit.* p. 185. t. 19. *Hook. Brit. Fl.* vol. ii. p. 318. *Harv. in Mack. Fl. Hib.* part 3. p. 232. *Harv. Man.* p. 145. *Wyatt, Alg. Danm.* no. 35. *J. Ag. Alg. Medit.* p. 23. *Endl. 3rd Suppl.* p. 21. *Kütz. Phyc. Gen.* p. 309. t. 42. f. 1. *Montg. Canar. Crypt.* p. 182. *Pol. Leed.* p. 35, *Alger.* p. 48.

CODIUM *elongatum*, *Ag. Sp. Alg.* vol. i. p. 454. *Ag. Syst.* p. 177. *Endl. 3rd Suppl.* p. 21. *Montg. Alger.* p. 50. t. 13. f. 1.

CODIUM *lineare*? *Ag. l. c.*

CODIUM *filiforme*? *Montg. Alger.* p. 50. t. 10. f. 2.

SPONGODIUM *tomentosum*, *Lamour. Ess.* p. 73.

SPONGODIUM *commune*, *Bory, Dup. Voy. Bot.* p. 210.

FUCUS *tomentosus*, *Huds. Fl. Ang.* p. 514. *Stack. Ner. Brit.* t. 7. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 195. *E. Bot.* t. 712. *Esper, Fuc.* t. 112. *Turn. Syn.* vol. ii. p. 300. *Hist.* t. 135.

AGARDHIA *dichotoma*, *areolata*, et *ramentacea*, *Cabrera, in Phys. Sällsk. Arsher.*

HAB. On rocks in the sea, within the range of the tide; generally near low-water mark. Perennial. Summer. Common on the rocky shores of the British Islands.

GEOGR. DISTR. Common on all the shores of Europe, both Mediterranean and Atlantic. Dispersed also throughout the temperate and torrid portions of the Atlantic, Pacific, and Indian Oceans. New Holland and Tasmania. Auckland Islands.

DESCR. *Fronds* rising from an expanded velvety incrustation, which forms wide patches on the surface of rocks, solitary, or gregarious, from six inches to two feet in length, from two to four lines in diameter at the base, erect, more or less regularly dichotomous, with or without lateral ramuli. *Branches* cylindrical or frequently compressed, linear, obtuse, often expanded, sometimes greatly so, beneath the forkings. *Axils* rounded. The whole frond is coated with delicate, hyaline, horizontal filaments, one or two lines in length, and of a very soft and gelatinous substance. *Structure*; the axis is composed of innumerable, interwoven, irregularly branched, slender filaments, from which issue radiating, horizontal, somewhat clavate ramuli, whose apices constitute the surface of the frond. To the sides of these ramuli are attached the ovato-lanceolate subsessile *coniocystæ*, which contain



at maturity, an oval, transversely striate, dark green mass, which is eventually discharged through a terminal pore.

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At plate XXXV, I figured two of the more minute species of *Codium* ;\* I here present one which is of larger size, more generally known, and the most widely dispersed of the genus. It occurs throughout the Pacific Ocean from the shores of Arctic America and Asia, to the southern extremity of America ; and is equally dispersed throughout the Atlantic. In general features, specimens from most countries agree, but there are slight points of difference, on which authors have founded species, which I cannot but regard as mere varieties of a common type. Such is the *C. elongatum* of Agardh, an admirable figure of which is given in the splendid 'History of Algiers,' now publishing under the auspices of the French Government. This *form*, which accompanies the common *C. tomentosum* on the West coast of Ireland, is chiefly remarkable for a great dilatation of the frond immediately under the forking of the branches. This enlargement certainly gives the specimens a distinct look, but traces of it may be found in various degrees of development, inseparably connecting the most dissimilar looking individuals of *C. elongatum*, with the common dichotomous, filiform *C. tomentosum*. Were *C. elongatum* admitted as a species, several other forms might be enobled on grounds as valid. There is, for instance, a common state of this plant, which is very irregularly divided, having the branches set with numerous lateral branchlets half an inch to an inch long, which is as abnormal as *C. elongatum*.

*Codium tomentosum* has to the naked eye quite the appearance, though not the substance or structure, of a sponge ; and, indeed very closely resembles in form and colour the *Spongia hispida*, Mont., offering a beautiful instance of *analogy* between organisms whose *affinity* is widely separated.

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\* To the habitats given under Pl. XXXV. for *C. adhærens* add Rathlin Island, Antrim, *Mr. D. Moore*, and Tory Island, *Mr. G. Hyndman*. Mr. Moore's specimens were gathered in 1834, and to him, therefore, the credit of being the discoverer of this plant in Ireland belongs.

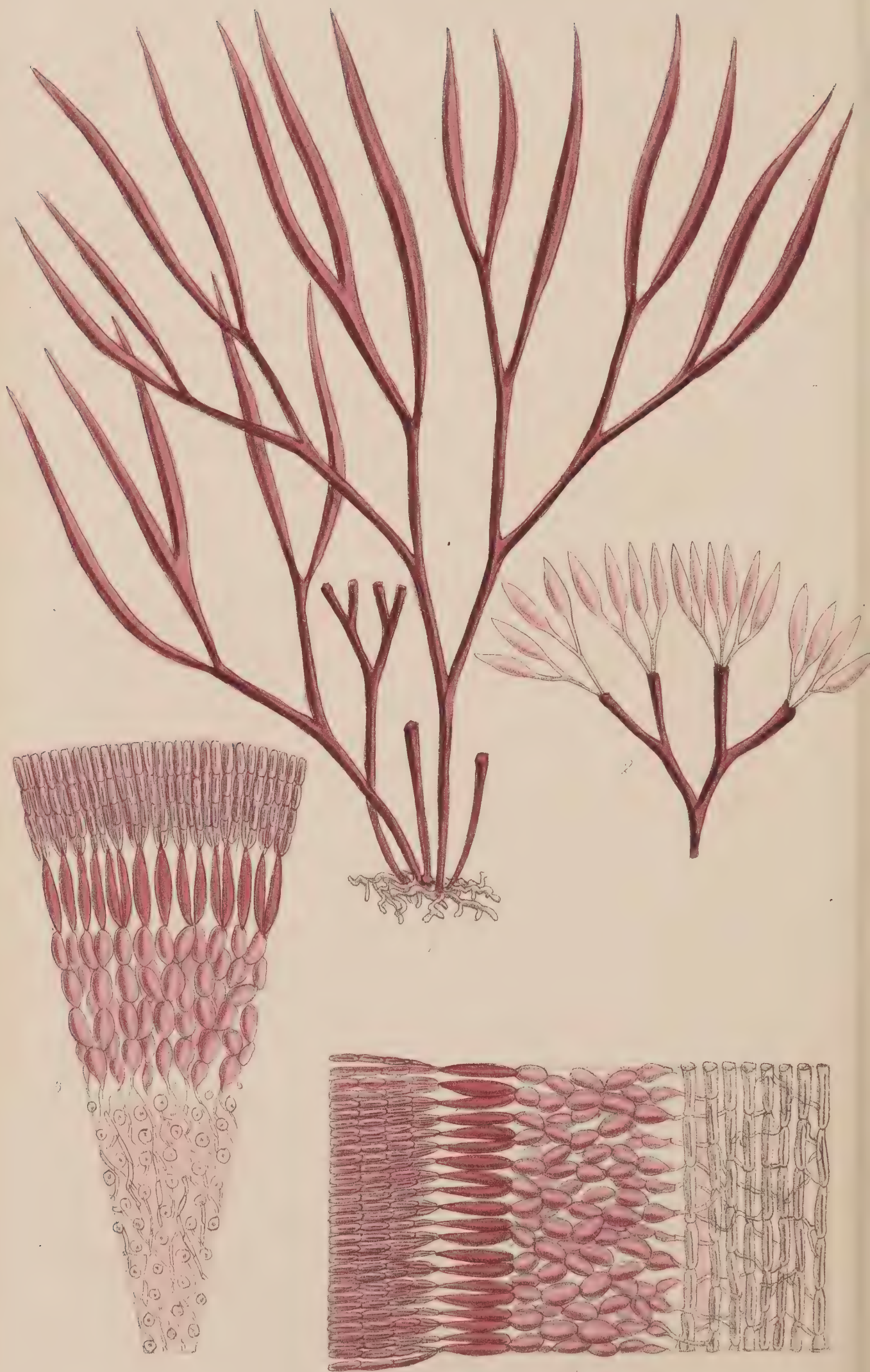
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Fig. 1. CODIUM TOMENTOSUM:—*of the natural size*. 2. Filaments of the periphery, with fruit:—*highly magnified*.

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## PLATE XCIV.

FURCELLARIA FASTIGIATA, *Lamour.*

GEN. CHAR. *Root* branching. *Fron*d cylindrical, dichotomous, cartilaginous, solid; the *axis* consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the *periphery* of coloured, horizontal, dichotomous filaments, issuing from those of the axis, whose lower half is composed of large, elliptical cells; their apices of much smaller cylindrical cellules. *Fructification*, "terminal, elongated, pod-like receptacles, containing a stratum of dark, oblong, pear-shaped spores in the circumference" (Grev.). FURCELLARIA (*Lamour.*),—from *furcula* or *furcilla*, a little fork; alluding to the forked frond.

## FURCELLARIA fastigiata.

FURCELLARIA fastigiata, *Lamour. Ess.* p. 26. *Ag. Sp. Alg.* vol. i. p. 103. *Ag. Syst.* p. 274. *Grev. Fl. Edin.* p. 286. *Grev. Alg. Brit.* p. 67. t. 11. *Hook. Brit. Fl.* vol. ii. p. 283. *Wyatt, Alg. Danm.* no. 106. *Harv. in Mack. Fl. Hib.* part 3. p. 190. *Harv. Man.* p. 54. *Endl. 3rd Suppl.* p. 38. *Kütz. Phyc. Gen.* p. 402. t. 71.

FURCELLARIA lumbricalis, *Lamour. Ess.* p. 26. *Lyngb. Hyd. Dan.* p. 48. t. 40. *Hook. Fl. Scot.* part 2. p. 97. *Spreng. Syst. Veg.* vol. iv. p. 315.

FUCUS fastigiatus, *Huds. Fl. Ang.* p. 588. *Lightf. Fl. Scot.* p. 930. *Gm. Hist.* p. 108. t. 6. f. 1. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 199. *Stack. Ner. Brit.* t. 6 and 14. *Fl. Dan.* t. 393.

FUCUS lumbricalis, *Gm. Hist.* p. 108. t. 6. f. 2. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 204. *Turn. Syn.* p. 317. *Hist.* t. 6. *E. Bot.* t. 824.

FUCUS furcellatus, *Linn. Sp. Pl.* p. 1631. *Huds. Fl. Ang.* p. 589.

HAB. On submarine rocks, within tide marks, generally growing in tidal pools. Perennial. Winter. Common on the shores of the British Islands.

GEOGR. DISTR. Northern Ocean. Atlantic shores of Europe, and of North America.

DESCR. *Root* composed of entangled, branching fibres. *Fron*ds densely tufted, from four to eight inches in height, half a line to a line in diameter, filiform, cylindrical, rising with a simple stem for two to three inches, forked, and afterwards repeatedly dichotomous, with acute angles; all the tops of equal length. The tips of the branches are either much lengthened into what appear like lanceolate receptacles or pods, simple or forked, one to two inches long, and tapering to a fine point, which fall away at maturity; or, on different individuals, the truncated apices produce by a second growth, slender, forked ramuli, terminating in ovate, pale-coloured pod-like bodies, half an inch in length, and either simple or forked. The elongated pod-like apices are usually regarded as the fructification, and their falling away at stated periods favours the conjecture; but their structure is similar to that of other parts of the frond, except that the stratum of elongated concentric dark-coloured cells, which are usually regarded as the spores, and

which exist in all parts of the frond, are rather more developed. These are, however, very unlike *tetraspores*. Colour dark brownish red. Substance cartilaginous.

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There is such a strong external resemblance between the subject of this plate, and that of the following one (*Polyides rotundus*), that they are often mistaken one for the other, and without contrasting the fibrous root of the former, with the large scutate base of the latter, it might, in some instances, be difficult to discriminate between them. There is, indeed, some difference in the structure of the frond, but not of a very striking character, and though easily observed when slices of both are seen together under the microscope, most difficult of being defined in intelligible words. And yet, with this resemblance in general appearance, all modern authors, with the exception of Kützing, place them in different genera; and, until very lately, even in different families. This opinion of botanists is grounded on a great difference observed between the fructification of these plants; and is probably correct. But the fructification of *Furcellaria* is very imperfectly known, or if known, is of such an anomalous character that it is difficult to build upon it. The pod-like elongations of the branches, which are produced in winter, and drop off as the season advances, do indeed appear like fructification, and are so described by authors. But their structure is widely different from that of the fruit of other *Rhodosperms*; and if they be entitled to the name of fruit, it must be of the conceptacular kind, for the spores which they contain in no respect resemble tetraspores. If my dissections be correct, they differ from other cellules only by being of a darker colour. They occupy no isolated portion of the frond, but are found, though of smaller size, in all its parts, extending in a stratum between the external and internal filaments of the periphery, between which they are the connecting links; being attached to both by one or other extremity. I shall be very glad of further information on the fructification of this plant, should any observer have detected *tetraspores*.

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Fig. 1. *FURCELLARIA FASTIGIATA*. 2. Portion of a frond with inflated tips:—both of the natural size. 3. A transverse, and 4, a longitudinal section of a "receptacle":—both highly magnified.

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## PLATE XCV.

POLYIDES ROTUNDUS, *Grev.*

GEN. CHAR. *Root* an expanded disc. *Fron*d cylindrical, dichotomous, cartilaginous, solid, the axis consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the *periphery* of coloured, horizontal, dichotomous filaments, whose lower half is composed of large, elliptical cells; their upper of much smaller, submoniliform cellules. *Fructification*, of two kinds, on distinct individuals; 1, oblong, irregularly formed, external *warts*, composed of dichotomous filaments, through which are scattered elliptical *favellæ*, having a broad pellucid limbus. 2, cruciate *tetraspores* immersed, at intervals, among the filaments of the periphery. POLYIDES (*Ag.*),—from πολυ, *many*, and ἰδέα, *form* or *appearance*; a name ill applied to the present genus.

## POLYIDES rotundus.

POLYIDES rotundus, *Grev. Alg. Brit.* p. 70. t. 11. *Hook. Brit. Fl.* vol. ii. p. 284. *Wyatt, Alg. Danm.* no. 161. *Harv. in Mack. Fl. Hib.* part 3. p. 190. *Harv. Man.* p. 43.

POLYIDES lumbricalis, *Ag. Sp. Alg.* vol. ii. p. 392. *Ag. Syst. Alg.* p. 194. *Spreng. Syst. Veg.* vol. iv. p. 344. *Endl. 3rd Suppl.* p. 38.

SPONGIOCARPUS rotundus, *Grev. Fl. Edin.* p. 286.

FURCELLARIA rotunda, *Lyngb. Hyd. Dan.* p. 49.

FURCELLARIA lumbricalis, *Kütz. Phyc. Gen.* p. 402. t. 72.

CHORDARIA rotunda, *Hook. Fl. Scot.* part 2. p. 97.

GIGARTINA rotunda, *Lamour. Ess.* p. 49.

FUCUS rotundus, *Gm. Hist.* p. 110. t. 6. f. 3. (*excl. syn. Huds. and Raii.*) *Linn. Syst. Nat. Gm.* p. 1383. *With.* vol. iv. p. 110. *Turn. Syn. Fuc.* vol. ii. p. 309. *Turn. Hist.* t. 5. *E. Bot.* t. 1738.

FUCUS radiatus, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 202. *Stack. Ner. Brit.* p. 89. t. 14.

FUCUS caprinus, *Gunn. Fl. Norv.* vol. i. p. 96.

FUCUS fastigiatus, *Herb. Linn. (sec. Turn.) Esper*, t. 16 (*excl. syn.*).

HAB. On rocks in pools, within the tide range. Perennial. Winter. Frequent on the shores of England and Ireland. Jersey, *Miss White* and *Miss Turner*. Rare in Scotland? Appin, *Capt. Carmichael*. Dumfries, *Sir J. Richardson*. Frith of Forth, *Mr. Maughan*, *Mr. Stewart*, *Dr. Greville*. Aberdeen, *Dr. Dickie*. Orkney, *Rev. Mr. Clouston*, *Rev. Mr. Pollexfen*, *Lieut. Thomas*, *Dr. Mc'Bain*. Ardrosan, *Major Martin*, and *Rev. D. Landsborough*.

GEOGR. DISTR. Atlantic shores of Europe from Iceland to France (and Spain?). Atlantic shores of North America. Boston, *Mr. Emerson*. New York, *Prof. Bailey*. Adriatic Sea, *Wulfen* (omitted by *J. Agardh*).

DESCR. *Root* a fleshy, flattened, circular disc, half an inch or more in diameter.

*Fronds* densely tufted, from four to eight inches high, as thick as a crow's quill, cylindrical, rising with a simple stem from one to three inches in length, then forked, and afterwards repeatedly and closely dichotomous; the axils rounded. *Apices* of equal length. *Fructification*, of two kinds on distinct plants; 1, fleshy warts of a pale pinky colour, from a quarter to half an inch in length, bursting out irregularly from various parts of the branches, composed of vertical, dichotomous, moniliform, slender filaments, among which are thickly scattered large, oval *favellæ*, containing a densely compacted cluster of conical spores. 2, oblong *tetraspores*, divided cross-wise, scattered at intervals among the filaments of the periphery of the frond, through all the upper branches of plants which produce them, vertical, deeply sunk. *Colour* a dark brownish red. *Substance* cartilaginous.

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The genus *Polyides* is remarkable for its singular fructification, which strikingly differs both in appearance and structure from that of any other of the *Rhodospiræ*. In appearance the conceptacular fruit most nearly resembles what are called *nemathecias*, but the distinct and isolated *favellæ* which it contains are very different from the contents of those imperfectly organized excrescences. Here, in what look like irregular warts, we have most perfectly formed and symmetrically arranged spores. The *tetraspores*, which are now, I believe, described for the first time, were discovered by Mrs. Griffiths, whose researches into the fructification of the Algæ are beyond all praise, and to her I am indebted for specimens, producing this description of fruit. It is found in winter, but on plants which do not form warts.

*Polyides rotundus* has a wide range in the northern hemisphere, being found through most of the cold and temperate latitudes of the Atlantic. It is perhaps the only species of the genus; the *P. D'Urvillæi* of Bory being a doubtful species, very possibly not a congener.

I follow Greville in retaining the specific name adopted in the great work of Turner, the foundation of modern Phycology, in place of that selected by Agardh from Bauhin's '*Pinaæ*', though to the latter the mere priority may belong. The truth is, that the strong resemblance between *Polyides rotundus* and *Furcellaria fastigiata* (*Fucus lumbricalis*, Gm.), has caused their synonymy to be so confused in the works of early writers, that it is a question to which of them Bauhin applied the name *lumbricalis*. Even Linnæus confounded one with the other.

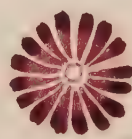
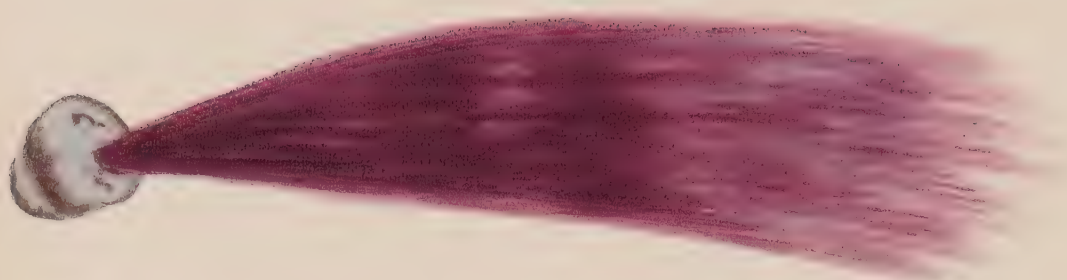
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Fig. 1. *POLYIDES ROTUNDUS*:—*of the natural size*. 2. Transverse section of the frond, and of a wart. 3. A favella. 4. A spore from the same. 5. One of the filaments of which the wart is composed. 6. Transverse section of a frond, with *tetraspores*. 7. *Tetraspores*:—*all more or less highly magnified*.

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## PLATE XCVI.

BANGIA FUSCO-PURPUREA, *Lyngb.*

GEN. CHAR. *Frond* filiform, tubular, composed of numerous radiating cellules, disposed in transverse rows, and enclosed within a hyaline continuous sheath. *Spores* purple or green, formed within each of the cells of the frond. BANGIA (*Lyngb.*),—in honour of *Hofmann Bang*, a Danish botanist, and friend of *Lyngbye*.

BANGIA *fusco-purpurea*; filaments elongated, simple, decumbent, nearly straight, here and there constricted, forming a brownish-purple, glossy stratum; granules several in each transverse band, dark purple.

BANGIA *fusco-purpurea*, *Lyngb. Hyd. Dan.* p. 83. t. 24. *Grev. Fl. Edin.* p. 302. *Spreng. Syst. Veg.* vol. iv. p. 361. *Grev. Alg. Brit.* p. 177. *Hook. Brit. Fl.* vol. ii. p. 316. *Wyatt, Alg. Danm.* no. 167. *Harv. in Mack. Fl. Hib.* part iii. p. 241. *Harv. Man.* p. 172. *J. Ag. Alg. Medit.* p. 14. *Kütz. Phyc. Gen.* p. 249. *Chauv. Mém. sur Bangia, Recherches*, p. 35.

BANGIA *atro-purpurea*, *Ag. Syst.* p. 76. *Ag. Ic. Alg. Eur.* t. 25. *Endl. 3rd Suppl.* p. 18. *Kütz. Phyc. Gen.* p. 250.

BANGIA *versicolor*, *Kütz. l. c.* p. 250. t. 45. f. 3.

CONFERVA *fusco-purpurea*, *Dillw. Conf.* t. 92. *E. Bot.* t. 2055.

CONFERVA *atro-purpurea*, *Roth. Cat. Bot.* vol. iii. p. 208. t. 6. *Dillw. Conf.* t. 103. *E. Bot.* t. 2085.

HAB. On rocks and planks in the sea, within the tide range (also in fresh-water rivers and canals). Common on the shores of England and Ireland, in many places. Rare in Scotland? Frith of Forth, *Prof. Arnott*. Jersey, *Miss White*.

GEOGR. DISTR. Atlantic Shores of Europe, from the Fœroe Islands to France. Mediterranean Sea.

DESCR. *Fronds* fixed by their base, aggregated into widely spreading patches, several inches in diameter, capillary, from one to three or four inches in length, decumbent, or floating in the water, very flaccid, glossy and lubricous, some of the threads of much greater thickness than others. *Threads* cylindrical, composed of radiating, obconical cellules disposed in circles round a narrow central tube, and contained within a pellucid sheath; these circles of cells, closely piled on each other, constitute the frond. Each cell contains a dark purple mass of endochrome, which finally is compacted into a spore, and discharged, on the rupture of the parent cell, into the tube.

The genus *Bangia*, founded by *Lyngbye*, in honour of his friend and preceptor in Phycological studies, has, owing to its originally vague definition, been more than usually unfortunate in having intrusive species placed in it; as well as having a great



variety of characters assigned to it by the several authors who have taken it up. Even those who agree in making *B. fusco-purpurea* the typical species, describe its structure very differently; some asserting that this plant is flat, others tubular but plano-compressed, and others cylindrical. That the latter is its true character becomes at once evident, by making a transverse section of a filament, or, as is much more easily done, by cutting a half dry bundle of filaments into short frustules, which, when moistened, will immediately exhibit the circular wheel-like appearance, represented at our fig. 3.

M. Chauvin, in his excellent 'Recherches'\*, has entered at great length into the history of this genus, proposed a reformed character, and limited the species to *B. fusco-purpurea* (the type), *B. crispa*, *B. ciliaris*, and *B. elegans*, Chauv., the last-mentioned differing from the others in having a branching frond. *B. Laminariæ* of Lyngbye, is, he assures us, identical with the young state *Asperococcus? pusillus*, Cann., its affinity with which was long since pointed out by Mr. D. Moore. While I admit the near proximity of these plants, I am not yet prepared to unite them. *B? lætevirens*, on the same authority, is only the rudimentary state of an *Enteromorpha*; and this I am disposed to allow.

A curious point in the history of *Bangia fusco-purpurea* is, that it is found equally in the sea, and in fresh-water rivers and canals, reaching an equal degree of development and coloration in either situation. Such an indifference is very unusual among the Algæ; but I can perceive no sufficient distinctions between the fresh-water and marine specimens to found a separate species upon. Prof. Kützing, however, describes the fresh-water form under two names, *B. coccineo-purpurea* and *B. roseo-purpurea*; relying chiefly on the habitat, and some slight difference of colour. I fear these species cannot stand.

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\* Recherches sur l'organisation, la fructification et la classification de plusieurs genres d'algues, &c.: Caen, 1842.

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Fig. 1. *BANGIA FUSCO-PURPUREA*:—*of the natural size*. 2. Portions of filaments:—*magnified*. 3. A transverse section of a filament:—*highly magnified*.

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## PLATE XCVII.

IRIDÆA EDULIS, *Bory*.

GEN. CHAR. *Frond* flat, carnosocartilaginous, dull red; the central substance composed of densely interwoven, longitudinal fibres; the *periphery* of closely packed, horizontal, moniliform filaments. *Fructification* of two kinds, on distinct individuals; 1, spherical masses of spores (*favellidia*) immersed in the frond; 2, *tetraspores* forming a stratum at the base of the filaments of the periphery. IRIDÆA (*Bory*), —from *iris*, the *rainbow*; because some species reflect rainbow colours when growing under water.

IRIDÆA *edulis*; frond undivided, obovate, rounded at the apex, wedge-shaped at the base; with a short stem.

IRIDÆA *edulis*, *Bory*, in *Dict. Class. d'Hist. Nat.* vol. ix. p. 15. *Grev. Alg. Brit.* p. 158. t. 17. *Hook. Brit. Fl.* vol. ii. p. 308. *Wyatt, Alg. Danm.* no. 78. *Harv. in Mack. Fl. Hib.* part. 3. p. 189. *Harv. Man.* p. 53. *Endl. 3rd Suppl.* p. 37. *Kütz. Phyc. Gen.* p. 396.

HALYMENIA *edulis*, *Ag. Sp. Alg.* vol. i. p. 202. *Ag. Syst.* p. 242. *Hook. Fl. Scot.* part 2. p. 107. *Spreng. Syst. Veg.* vol. iv. p. 333.

DELESSERIA *edulis*, *Lamour. Ess.* p. 38.

ULVA *edulis*, *Decand. Fl. Fr.* vol. ii. p. 12. *Grev. Fl. Edin.* p. 298.

FUCUS *edulis*, *Stack. Ner. Brit.* p. 57. t. 12. *With.* vol. iv. p. 101. *Turn. Syn.* vol. i. p. 180. *Turn. Hist.* t. 114. *E. Bot.* t. 1307. *Hook. in Fl. Lond. cum icone.*

FUCUS *dulcis*, *Gm. Hist. Fuc.* p. 189. t. 26 (*the figure only; the description belongs to F. palmata*).

FUCUS *lactuca*, *Esper, Ic. Fuc.* vol. i. p. 129. t. 64.

FUCUS *carnosus*, *Schmidel, It.* p. 76. *Esp. l. c.* p. 150. t. 76.

FUCUS *palmatus*, *β. Lightf. Fl. Scot.* p. 935.

HAB. On marine rocks, near low-water mark. Perennial. Fruiting in winter. Frequent on the shores of the British Islands, from Orkney to Jersey.

GEOGR. DISTR. Atlantic shores of Europe, from the shores of Iceland (*Esper*) to Spain (*Ag.*). Baltic Sea, *Agardh, Aresch!* Mediterranean at Malaga, *Ag.* Cape of Good Hope, according to a specimen in Herb. Paris, *Ag.*

DESCR. *Root*, an expanded callus. *Fronds* numerous from the same base, from six inches to a foot or more in length, and from two to six inches in breadth at the widest part, rising with a short, cylindrical stem, of a few lines in length, which becomes first compressed, then quite flat, and gradually expands into the cuneate base of a perfectly simple, obovate frond, which is very obtuse and rounded at the apex. It is subject to very little natural variation in form, except in being occasionally oblique, one side expanding more rapidly than the other; but no plant is more subject to injury either from the attacks of marine animals, or laceration by the

waves, and its fronds are usually much perforated, or split longitudinally; the apices erose or laciniated. *Fructification*; 1, *favellidia* immersed beneath the periphery, densely scattered in the upper portion of the frond, appearing to the eye like minute dark red dots, composed of very densely packed, angular spores; 2, *tetraspores* either triparted or cruciate, disposed in very dense band-like sori, the sorus lying beneath the filaments of the periphery, and extending across the upper portion of the frond. *Colour* a full dark blood-red; becoming much darker in drying. *Substance* firmly cartilaginous, or somewhat fleshy.

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It is a singular, and almost an unaccountable fact, that this plant, than which none are more invariable in character, or more distinct in general appearance, should have been long confounded with *Rhodymenia palmata*, a plant of a very different form, different structure, and different substance. Withering was the first author who clearly defined the present; but it is to be regretted that he assigned the specific name *edulis* to it, for though a favourite, certainly, with marine worms, it rarely constitutes a part of human food; the *R. palmata* being the true eatable *Fucus* or *Dulse* of the Scotch and Irish. I have never seen *I. edulis* eaten, but Stackhouse tells us that in Cornwall it is sometimes eaten by fishermen, who crisp it over the fire. The same author speaks of a fine ruby-coloured dye being extracted from it by simple maceration. Similar dyes exist in a great number of Algæ, but I should fear that they would not prove of a very permanent character.

The genus *Iridæa* is widely dispersed over the world, the maximum of the species being in the Pacific and Southern Oceans. Many of them are of very large size, and almost all, are excessively variable in form. Several of Bory's species have now been properly moved by Prof. J. Agardh, to the genus *Gigartina*, namely, *I. radula*, *striata*, *papillora*, and their allies.

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Fig. 1. *IRIDÆA EDULIS*:—*of the natural size*. 2. Section of a frond producing favellidia. 3. Section of a frond producing tetraspores. 4. Tetraspores separated:—*all magnified*.

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